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Quality of primary care and self-management of patients with type 2 diabetes in Muscat, Oman

PhD thesis

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To my Beloved late Parents

(My anchor, my love and inspiration)

Words cannot express how much you mean to me
Nothing could ever compare or even ever be
Your unconditional love and care that showered me
Is so irreplaceable, so precious
Will always live deep in me
My reason for living, my anchor my love
My world, my inspiration my heart and soul
Since you had left this world
I have lived in agony, distraught and pain
But your memory and blessing words shine from within
Calling out for me to rise and shine and be the best I could be,
My beloved Parents,
This is a token of my promise to you
To always make you as proud as you have always made me
May you rest in peace showered by an endless love
and a promise to reach for the sky…

ABSTRACT

Background: Diabetes mellitus is the most common non-communicable disease in Oman and its control remains a huge challenge for the health system.

Objectives: The first three studies aimed at exploring how health-care providers interacted with patients with type 2 diabetes at primary health-care level in Muscat, Oman, how the patients perceived these interactions and how the health care providers perceived diabetes care. Study four assessed diabetes self-management, awareness of complications, and attitudes about diabetes management among people living with type 2 diabetes.

Methods: Quantitative and qualitative research methods were used for data collection. Data for study I was collected through direct observations of 175 consultations among doctors and diabetes practice nurses using checklists developed from the National Diabetes Guidelines and other studies of patient-provider interaction. Data for study II was collected through focus group discussions with patients, while face-to-face interviews with providers were conducted in study III. A questionnaire-based survey among patients was used to collect data for study IV. Statistical analyses were used for the quantitative data, while qualitative content analysis was applied for the qualitative data.

Main findings: The interactions between health-care providers and their type 2 diabetes patients were sub-optimal in more than 50 % of consultations and there was poor collaboration between the health care staff working in diabetes care. The quality of the diabetes nurses' interactions was sub-optimal in 75% of their consultations. The combined scores of all aspects for both doctors and diabetes nurses showed that they interacted optimally with the patients in only one health centre. In sub-study II, the patients expressed their dissatisfaction with issues related to the organization of the diabetes clinics and they perceived the doctors and nurses to be neither experts nor sufficiently competent in diabetes care. Patients expressed their inability to participate in the medical dialogue or communicate their concerns. In sub-study III, organizational barriers and barriers related to patients and health care providers were identified such as: workload; lack of teamwork approach; patients' poor management adherence and influence of culture on their attitudes towards illness; frustration of doctors and nurses due to unsuccessful efforts with the patients and tendency to aggressive behaviour with non-adherent patients. In sub-study IV, 62% of patients had a poor self-management score, while home glucose monitoring was practiced by 38% of patients. Many patients were unaware about how to recognize hypoglycaemia or respond to it, but were good at demonstrating methods to stabilize blood glucose.

Conclusions and recommendations: Clearly defined professional roles and appropriate education to support patients to be able to have a key role in their own care are essential. The role of diabetes nurses should be enhanced. A multidisciplinary team approach and training of the providers to upgrade their skills regarding communication and care with emphasis on patient-centred approach are needed. The findings further reflect the need for changes in professional behaviour towards a less authoritarian style and to recognize cultural influences and the patients' beliefs in order to individualize the care according to patients' needs. The results can be useful for the policy makers in Oman and countries with similar health systems, for improving the quality of diabetes care and the organizational efficiency of diabetes clinics.

Keywords: Diabetes mellitus type 2; primary health-care; patients' perceptions; patient-doctor interaction; self-management behaviour; Oman

PUBLICATIONS

This thesis is based on the following articles, which will be referred to by their Roman numerals.

I. **Abdulhadi N,** Al-Shafaee MA, Östenson CG, Vernby A, Wahlström R. Quality of interaction between primary health-care providers and patients with type 2 diabetes in Muscat, Oman: An observational study. *BMC Family Practice.* 2006; 7:72.

II. **Abdulhadi N,** Al-Shafaee MA, Freudenthal S, Östenson CG, Wahlström R. Patient-provider interation from the perspectives of type 2 diabetes patients in Muscat, Oman: a qualitative study. *BMC Health Services Research* 2007; 7:162.

III. **Abdulhadi N,** Al-Shafaee M, Wahlström R, Hjelm K. Doctors' and nurses' views on patient care for type 2 diabetes: an interview study in primary health care in Oman. *Primary Health Care Research and Development* 2012 Dec 21:1-12. [Epub ahead of print]

IV. Elliott J *, **Abdulhadi N** *, Al-Maniri AA, Al-Shafaee MA, Wahlström R, Diabetes self-management and education of people living with diabetes: A survey in primary health care in Muscat, Oman. Submitted for publication.

* First two authors have contributed to the same extent and should be regarded as first authors.

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CONTENTS

ABBREVIATIONS

DSME	Diabetes self-management and education
FGD	Focus Group Discussion
GDP	Gross Domestic Product
HbA1c	Glycosylated haemoglobin
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
MoH	Ministry of Health
NCDs	Non-communicable diseases
NGOs	Non-governmental organisations
OHA	Oral hypoglycaemic agents
PHC	Primary health care
PHCC	Primary health-care centre
SMBG	Self-monitoring of blood glucose
SPSS	Statistical Package for the Social Sciences
UNDP	United Nations Development Programmes
WHO	World Health Organization

Willayat in the Arabic language refer to districts, the singular is Willayah (one district)

PREAMBLE

I am a medical doctor by training. After my graduation from the medical college, I worked in the primary health care in Muscat, Oman from 1996-2004. I was later given the opportunity by the Ministry of Health in Oman to study at Karolinska Institutet, the Division of Global Health (IHCAR).

My interest in the quality of care for persons with diabetes was stimulated before I started my research at IHCAR. During my work as a GP in primary health care centres in Muscat, I noticed that most of the patients with type 2 diabetes had high blood sugar levels. I seldom met a well-controlled patient with diabetes or a patient without associated risks such as hypertension or hyperlipidaemia, despite their regular follow up, routine investigations and medications. The concerned health care providers had access to guidelines for diabetes care and the clinics were well equipped.

In addition, I used to notice a lot of expressions like explanation of discomfort on the faces and eyes of the patients, especially the middle and old age groups. I felt there was something they wanted to say but there was a barrier to do so. I reached a conclusion that it is our responsibility as doctors towards the patients not to ignore such expressions and that they should be listened to as human beings with feelings, concerns and expectations.

I started thinking about exploring and understanding the reasons for all these and for poor control and how the quality of diabetes care could be improved in the Omani context. My personal experience and observations guided my thinking towards the interaction between the patients, doctors and other diabetes team members. I decided to start with the quality of provider-patient interaction and communication, which I believe is a first step towards a proper diabetes care.

This thesis is an effort to increase my personal knowledge and improve my understanding of quality of care and interaction, through research and evidence-based knowledge for practice. I hope that the findings of this study and the recommendations will be useful to the health policy makers and my colleagues in Oman.

1 INTRODUCTION

1.1 Diabetes mellitus

Diabetes mellitus is a chronic disease that is characterized by hyperglycaemia and occurs when the pancreas does not produce enough insulin that regulates blood sugar, or alternatively, when the body cannot effectively use the insulin it produces due to insulin resistance or decreased insulin sensitivity (1). There are two common forms of diabetes. Type 1 diabetes (previously known as insulin-dependent or childhood-onset) is characterized by a lack of insulin production and is rapidly fatal without daily administration of insulin. Type 2 diabetes (formerly called non-insulin-dependent or adult-onset) is a heterogeneous disorder also characterized by chronic hyperglycaemia. The aetiological heterogeneity is suggested by its polygenetic inheritance and its interplay with environmental factors. Impaired insulin secretion and decreased insulin sensitivity are the main pathophysiological features, responsible for development of hyperglycaemia in type 2 diabetes. The pathogenesis of diabetes is shown in figure 1 (1). Note that hyperglycaemia and hyperlipidaemia may further impair both beta-cell function and insulin sensitivity due to glucotoxic and lipotoxic effects, respectively.

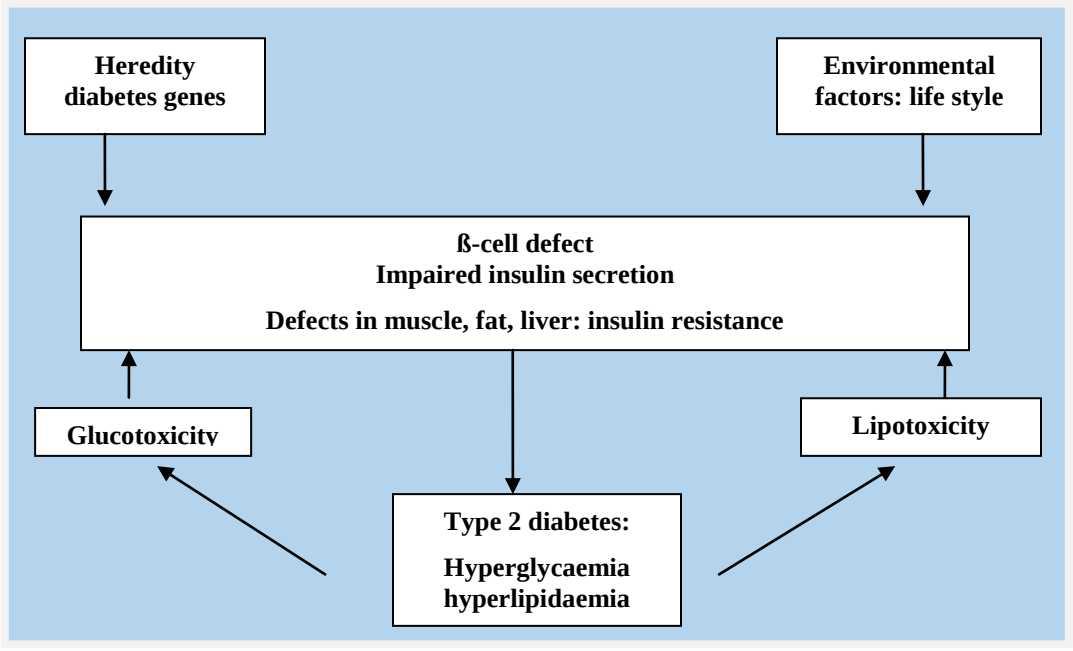

Figure 1. *Proposed pathogenesis of type 2 diabetes (1)*

Type 2 diabetes comprises 90% of people with diabetes around the world, and is largely precipitated by factors such as excess body weight and physical inactivity, causing decreased insulin sensitivity. Until recently, type 2 diabetes was seen only in adults but it is now also occurring in obese children (2).

Another type of diabetes is gestational diabetes mellitus that usually disappears after pregnancy, but in most cases forebodes a high risk of type 2 diabetes in the future. In some cases gestational diabetes is the start of type 1 diabetes (2). Impaired Glucose Tolerance (IGT) and Impaired Fasting Glycaemia (IFG) are intermediate conditions in the transition between normality and diabetes. People with IGT or IFG are at high risk of progressing to type 2 diabetes (3).

Type 2 diabetes is a complex condition with dyslipidaemia occurring in up to three fourths of those with diabetes and hypertension present in up to 70% of patients (3). The quality of life for people with type 2 diabetes can be largely preserved, and their risk of long term complications reduced, through proper control of glycaemia, lipidaemia and blood pressure, and through provision of effective health education (3).

1.2 Global burden of diabetes

Non-communicable diseases (NCDs) such as diabetes are the leading global causes of death, causing more deaths than all other causes combined, and they strike hardest at the world's low- and middle-income populations (4).

The world prevalence of diabetes among adults (aged 20-79 years) in 2011 was estimated to be at 8.3%, affecting 366 million individuals, and is estimated to increase to 9.9%, or 552 million adults, by 2030 (5). More than 371 million people had diabetes in the year 2012. The number of people with diabetes is increasing in every country and 80% of people with diabetes live in low-and middle-income countries. It has been estimated that 183 million people (50%) with diabetes are undiagnosed (5).

Diabetes is the leading cause of severe complications and damage to body organs such as renal failure, in many populations in all countries regardless of level of development or income. Lower limb amputations are at least ten times more common in people with diabetes than in non-diabetic individuals. Diabetes is one of the leading causes of visual impairment and blindness (4). People with diabetes require at least two to three times the health-care resources compared to people who do not have diabetes,

and diabetes care may account for up to 15% of national health care budgets. In addition, the risk of tuberculosis is three times higher among people with diabetes (4).

NCDs may become an important driver to the downward spiral that leads families towards poverty (4). As a result, unless the NCDs epidemic is aggressively confronted in the most heavily affected countries and communities, the mounting impact of NCDs will continue and the global goal of reducing poverty will be undermined (4).

Millions of lives can be saved and untold suffering avoided, through reduction of main risk factors, such as obesity, hypertension, unhealthy diet, lipid disorder, smoking, harmful alcohol consumption, insufficient physical activity, and through early detection and timely treatments. The greatest effects of these risk factors fall increasingly on low- and middle-income countries, and on poorer people within all countries, mirroring the underlying socioeconomic determinants (4).

1.3 Global diabetes control strategy

To help preventing type 2 diabetes and its complications, people should achieve and maintain a healthy body weight through balanced food intake and physical activities: at least 30 minutes of regular, moderate-intensity activity 3-4 times per week (2).

The 2008–2013 Action Plan was developed by WHO and Member States to translate the *Global Strategy for the Prevention and Control of Non-communicable Diseases* including diabetes mellitus into concrete action (4). The plan highlighted six key objectives. For each objective, three distinct sets of actions were outlined for implementation by Member States, by WHO and by other international partners. These objectives are:

• To raise the priority accorded to non-communicable diseases in development work at global and national levels, and to integrate prevention and control of such diseases into policies across government departments;

• To establish and strengthen national policies and plans for the prevention and control of Non-communicable diseases;

• To promote interventions to reduce the main shared modifiable risk factors: tobacco use, unhealthy diets, physical inactivity and harmful use of alcohol;

• To promote research for the prevention and control of non-communicable diseases;

• To promote partnerships for the prevention and control of non-communicable diseases;

• To monitor non-communicable diseases and their determinants and evaluate progress at the national, regional and global levels.

Furthermore, the report stated that at least three interventions for prevention and management of diabetes and its complications have been shown to reduce costs while improving health. Blood pressure, glycaemic control, and foot care are feasible and cost-effective interventions for people with diabetes, mainly in low-and middle-income countries due to high prevalence and poor control in these countries (4).

WHO provides scientific guidelines for diabetes prevention; develops norms and standards for diabetes care; builds awareness on the global epidemic of diabetes including partnership with the International Diabetes Federation in the celebration of World Diabetes Day (14 November) (2).

More vitally, to meet the broader health challenges of diabetes, there is a need to focus on people-centred care by stakeholders and health care professionals to reach out to all people, families and communities beyond the clinical setting before they become patients, through appropriate health promotion to make the general population informed and empowered for protecting their own health (6).

1.4 Diabetes management

It has been concluded that the quality of care for patients with type 2 diabetes remains sub-optimal worldwide regardless of the country's level of development, efficacious treatments available, health-care system, or population characteristics (7). Due to the nature and complexity of type 2 diabetes, a comprehensive and integrated care should be made accessible and affordable for the patients to attain high quality management of diabetes. This includes the identification and treatment of risk factors and provision of health education with emphasis on self-management and behaviour change such as adherence to medications; self-monitoring of blood glucose levels, and proper education about nutrition (8).

Effective health education should be provided with respect to the patients' level of education and variations in their understanding of the illness (9, 10), since patients with diabetes who had low literacy level and lower knowledge about diabetes and self-management had poorer health outcomes (11,12).

It has been suggested that understanding diabetes patients' views and perceptions of their own role in disease management, their motivations and barriers to good management is important so that the health education can be tailored to individual needs (13). Three simple and effective open ended questions to the patients with diabetes have been designed by expert Swedish researchers in the field of diabetes and Public Health and Caring Sciences, who recommended capturing participants' intuitive beliefs about their roles in diabetes treatment. These questions are: 'What is your role in your diabetes management?; 'What is your goal with your diabetes management?; and 'What kind of support do you need for your diabetes management? (13).

It has been concluded that a multidisciplinary team approach is more effective and efficient for diabetes management (14,15). In particular the presence of diabetes specialist nurse who have both the skill and time to address patient's needs has a positive effect on the quality of diabetes care and health outcomes (16). Health systems with strong primary health care are more likely to give greater attention to the management of people with diabetes in teams, including specialized diabetes care nurses who share some of the physicians' responsibilities (17, 18).

1.5 Patient-provider interaction

1.5.1 Communication skills

The medical encounter is a core clinical skill for all health care providers particularly at primary care level (19). Physicians and other health care providers need to have high quality communication skills and good relationship with diabetes patients to support their learning and to effectively manage their illness (9, 20). Furthermore, focusing particularly on patient-doctor interaction is not enough with regard to management of diabetes, communication skills of other diabetes team members should also be emphasized (21).

There are different definitions of a good communication and several verbal and non-verbal types of behaviour that have been found to be important for creating a good patient-provider communication during consultations at primary care level (22). It has been concluded in several studies that friendliness and doctor's courtesy; attentive listening; eye contact with less gazes; positive facial expression; social talk; information giving and seeking; emphasis on patient's understanding to the presented information;

uninterrupted consultation; and sufficient consultation lengths are important components for good patient-doctor communication and relationship (9, 22, 23, 24).

These types of behaviour are objectively measurable and have been linked in empirical studies with favourable patient outcomes such as satisfaction and recall, intermediate outcomes such as adherence, and long-term outcomes such as symptom resolution and better quality of life (19). Furthermore, Pendleton et al (24) listed seven tasks in their consultation map that support a more patient-centred approach and ensure a positive consultation environment. Some important aspects for the doctor are to actively enquire about the patients' beliefs and fears in relation to symptoms and signs, and their interpretation of the disease and what they think should be done to improve their well-being (24).

Some problems in communications can arise during history taking or during discussion of how the patient's complaints should be managed. These problems may be related to a lack of communication skills on the part of either the physician or the patient (25). Furthermore, some of physician barriers to good interaction could be related to lack of knowledge; lack of support from other trained providers; lack of beliefs in treatment guidelines; poor patient adherence or poor response to treatment; and unsuccessful efforts to encourage the patients to achieve life style changes (25).

Patient barriers include: no acceptance and absence of symptoms; divergent cultural concepts; chronicity of the disease; specific expectations and beliefs; and co-morbid conditions (15). Low education level among patients has been considered as a barrier for good communication and health outcomes due to its negative effect on patients' ability to communicate their history and on physicians' ability to solicit information (26).

1.5.2 Patient-provider interaction and culture

Patient-provider interaction is also affected by the social and cultural background of provider and patient. Culture has an important influence on many aspects of a person's life such as behaviour, beliefs and attitudes to illness and health and on dietary beliefs and practices that sometimes are difficult to change (27). Culture must always be seen in its particular context which is made up of historical, religious, ritual, family structure,

diet, social and geographical elements that mutually influence culture and are also influenced by culture (27).

In addition, linguistic barriers and different ways of interpreting experience with illness and treatment can cause problems in the communication and understanding when the patient and health care provider come from different cultures (28). In this respect, to help patients gain real and better control over their diabetes, health care professionals need to understand patients' health beliefs, how they perceive the disease, and other social norms (29).

1.5.3 Patient-centred approach

The health care providers should support patients and facilitate their empowerment by encouraging them to make informed personal decisions in their everyday life with diabetes and to enhance their participation in the consultations. This requires major changes in provider-patient interaction from an authoritarian towards a more sharing and supportive approach (29,30). Diabetes patients who had medical encounters characterized by patient-centred care and continuity of care were found to be more satisfied and had better health outcomes as concluded from studies done in Sweden and United Kingdom (31, 32).

Patient-centred care is an important aspect of the interaction and regarded to be a key factor to outcomes improvements (29). The concept has a wide range of somewhat different definitions as reviewed in Cochrane database (33). Some researchers have described patient-centred care as "understanding the patient as a unique human being", while some others have stressed the importance of eliciting each patient's expectations, feelings and fears about the illness (33). Moreover, it has been concluded that the doctor uses the patient's knowledge and experience to guide the interaction during the consultation. In addition, it has been described that patient-centred care is an approach or consulting style that is opposite to a physician-dominated and illness-oriented style where physicians are aiming only at diagnosis and treatment of the diseases, not the whole person (33).

Mead and Bower identified five conceptual dimensions of patient-centred care: 1) the biopsychosocial perspective, a perspective on illness that includes consideration of social, psychological as well as biomedical factors; 2) the 'patient–as-person'-

understanding experience and personal meaning of illness for each individual patient; 3) sharing power and responsibility, sensitivity to patients' preferences for information and shared decision-making; 4) the therapeutic alliance, developing common therapeutic goals and enhancing a patient-doctor relationship based on care and empathy; 5) the 'doctor –as- person'- awareness of the influence of the personal qualities and subjectivity of the doctor on the practice of medicine (34).

Factors related to clinical settings such as workload pressure in the clinics and time allotted for the visits may limit the propensity of health care providers to adopt the patient-centred approach. Furthermore, patient's attitudes and expectations, personality, gender, age, knowledge and nature of problems are important factors that potentially influence patient-centred care (34). Beliefs about health and illness including biomedical and traditional explanations related to the influence of supernatural forces, such as fate, God etc., were found to be as important elements that affect patients' self-care and care-seeking behaviour. Thus this could affect patients' empowerment and patient-centred approach (35).

It has been reviewed that a direct approach to patient self-care behaviour and participation in diabetes care is effective, more effective than focusing on changing provider consultation behaviour (29). Possibly, a combination of approaches (patient and provider, and organisation of care supportive) has considerable potential to produce even better, important and lasting outcome improvements. This could be achieved by offering: (a) support to directly enhance patient participation, (b) support to improve provider participatory behaviour in consultations and education, and (c) support to providers to improve organisation and quality of care by feedback of outcomes, and additional (para) medical education (29).

2 BACKGROUND

2.1 Country profile

The Sultanate of Oman is located in the south-eastern corner of the Arabian Peninsula. Its coastal line extends 3,165 kilometres from the Strait of Hormuz in the North to the borders of the Republic of Yemen in the Southwest, overlooking three seas: the Arabian Gulf, Gulf of Oman and the Arabian Sea. It borders the Kingdom of Saudi Arabia and the United Arab Emirates in the West, and the Republic of Yemen in the South. Due to the long coastline, fisheries and sea trade have been an important part of Oman's history (36).

The total area of the Sultanate of Oman is approximately 309.5 thousand square kilometres. The country is composed of varying topographic areas consisting of plains, dry river beds *(wadis)* and mountains. The mountain ranges occupy almost 15% of the total land of Oman. The remaining area is mainly wadis and desert (about 82% of the total area). The climate differs from one area to another; it is mostly hot and humid in most of the regions (36).

The Sultanate of Oman is administratively divided into eleven governorates with 61 districts *(*locally known as *willayat)* distributed among the governorates (35). According to the 2010 census (36), the total population of Oman is 2.77 million (1.95 Omanis and 0.82 non-Omanis). About 28 % of the total population are living in Muscat, the capital of Oman (36).

Historically, no country since Persia has successfully invaded Oman which, by the 19th century was a sovereign power in its own right, expanding its territory across the Arabian Gulf and East Africa, where it controlled the island of Zanzibar. The country went on to establish political links with the other great powers of the time, including Britain, France, the Netherlands and the United States. However in the early part of the 20th century, Oman entered a period of decline and isolation (37).

Prior to the stream of oil in 1964, the country had only a few basic roads, a tiny number of schools and little in the way of medical care; its people were poor and disadvantaged (37). Most of Omanis were seafarers and traders who dominated regional commodity trading in the Indian Ocean, East Africa and the Arabian Gulf. Many of Oman's wealthy and educated people had left the country to seek their fortunes abroad. One of the first challenges His Majesty Sultan Qaboos faced when he took power in 1970 was to reverse this "brain drain", to encourage the Omanis who left the country to return home for creation of a strong, educated and unified nation (37).

In November 2010, the United Nations Development Programme (UNDP) (38), identified top movers countries relative to the starting point in 1970 and ranked Oman first among 135 countries worldwide, as the most improved nation during the preceding 40 years. This progress is not only attributable to oil and gas earnings in Oman, but is largely due to impressive long-term improvements in health and education, the non-income dimensions of the Human Development Index (HDI). The 135 analysed countries by UNDP, for which complete, accurate and comparable data were available, included more than 90 % of the world's population (38). Furthermore, the World Bank has recently classified Oman as a high-income country since 2009 to date according to World Development Indicators (WDI) (39).

2.2 Demographics and social indicators

The ratio between women and men in Oman is 0.98 (49.5% women and 50.5% men). Life expectancy at birth was estimated to be 70.8 and 76.2 years for men and women respectively in the year 2010 (40). According to the Ministry of Health (MoH) estimation, 12.7% and 34.3% of the population are under-5 years and under-15 years respectively, and only 3.8% are 60 years and over (40).

The total Omani women population in their reproductive age group (15-49 years) represents more than a quarter (29%) of the total Omani population (40). Currently, the average annual population growth rate is around 2.7% and the population expected to increase two-fold in 25 to 30 years (40). The total fertility rate has considerably declined from 10 live births per women 15-49 years in 1980 to about 3.3 in 2010. This drop could be partly attributed to social development programmes implemented during the 1990s, such as female education and intensive birth spacing campaigns (40).

Due to the country's social and economic development, and intensive control of infectious diseases, the infant mortality rate has dramatically dropped from 159 during the 1970s to about 10 per 1000 live births in 2010. Within the same period, the under-five mortality rate declined from 181 to reach 12 per 1000 live births (40). The crude death rate (CDR) declined from 7.3 in 1993 to 2.9 per 1000 Omani population in 2010. This represented a 60% decline in the past eighteen years (40). Table 1 shows some economic indicators (36).

Table 1- Economic indicators in 2010

Indicator	Amount in US$
GDP at Current prices* (in Million)	57,7
GDP per Capita	17,9
Gross National Income (GNI) (Million)	43,9
GNI per Capita	13.8
Total Government Expenditures (Million)	20,5

Source: Ministry of National Economy (36).
**One Omani Rial = 2.60 US$*

The Ministry of Health expenditures (in per cent of Governmental expenditure) was 5.1% in 2010 (36).

The adult literacy rate is 78% (men 85%, women 71%). All Omani nationals enjoy free education through post-secondary school, vocational and higher education (41). Moreover, the Personal Status Law guarantees Omani women equal rights in both education and employment and that women all over Oman should contribute in the process of economic and social development (37).

In-spite of the economic success some challenges remain. For instance, about 25% of Omani households consume less than 250 Omani Riyals a month which is half the monthly mean expenditures of households nationally (42). Furthermore, a non-negligible portion of the Omani labour force is still seeking employment (13%), with a majority being men (77%), young (74% between the ages of 15 and 24 years) or with limited qualifications (94% did not have more than a secondary school education). The impact of unemployment on health is not well studied in Oman (42).

However, it is difficult to ascertain the level of poverty because Oman is a welfare state and substantial government social support is given, along with wide access to basic services (42). In addition to the provision of education and health services free of charge to citizens the government provides direct financial support to the disadvantaged and people below subsistence levels, inclusive of persons with special needs, widowed and divorced women, families of prisoners, orphans and the elderly (42). More than 50 000 families benefit from this social plan, in fact, 6.2% of the Omani population in 2003 received direct government financial support in addition to other support in kind. The government also provides houses, low interest housing loans and microcredit support to low-income families (42).

2.3 Health care in Oman

2.3.1 General overview

During the early 1970s, there were limited resources and several defects in the health infrastructure. There was a high prevalence of childhood illnesses such as poliomyelitis, tetanus, diphtheria, measles, mumps and pertussis and other communicable diseases (43). This situation influenced the Government to realize the importance of health in the social and economic development and that improved health would contribute to economic

growth by reducing production losses (40). A Royal Decree was issued to establish the MoH in August 1970. The MoH is the main health care provider in Oman and has to build a modern national system that offers all Omani citizens universally accessible health services free of charge all over the country. The MoH developed five-year plans, the first of which started in 1976 (40), and which are still on-going. Currently, the MoH is constantly working towards reaching the prime objective of developing better and high quality health care system in the Sultanate of Oman through setting up of a new National Health Policy, up to the year 2050 (40).

At present, the MoH is running 226 health care institutions scattered throughout the country, 176 health care centres and 50 hospitals. Of these, there are 14 regional referral hospitals, which act as secondary and tertiary hospitals. At least one Regional Referral Hospital has been established in each governorate (42). The citizens and non-nationals, who are working in the private sector, are covered by their employers as mandated by the Omani law. However, the government's current policy requires that the expatriate employees of the government and their dependent families also be provided free health care (42). Major companies provide medical insurance for their employees and dependents as a part of their compensation package (42).

Health care in Oman is also provided by other governmental and non-governmental bodies, including: Royal Oman Police, Armed Forces, Medical Services of Diwan of Royal Court, Petroleum Development, and Sultan Qaboos University Hospital (42). The private sector plays an important role in health care delivery in Oman. Its main role is concerted in secondary and tertiary health care in urban and semi-urban areas. However, most of the privately owned clinics provide primary medical care (42).

Beside these profit-oriented institutions, there are many non-governmental organisations (NGOs) which promote and provide social and medical care in the local communities. NGOs are active in several fields like disability; cancer awareness; diabetes; and women welfare (40).

The MoH has successfully reduced the incidence of health care associated infections, set-up an effective Epidemic Preparedness System, achieved the highest possible levels for early detection of communicable diseases, reduced incidence of both vaccine-preventable and non-vaccine-preventable communicable diseases (43). Oman is

now in the process of declaring malaria elimination, which was almost completed in 2011 (43).

Currently, the MoH ensures that only safe and potent licensed drugs are sold in the country or distributed to the patients of public hospitals and health centres. It is also monitoring medicine pricing in the private sector and promoting for rational use of medicines (42). Medicines and medical supplies comprise 11.3% of the total MoH expenditure (42). Furthermore, the MoH is further setting up regulations for monitoring herbal medicines, which are increasingly available in the country. However, the national capacity in this area remains limited (42).

2.3.2 Health system reform

The improvement of health system performance in Oman was reported by the WHO (44), in 1997 as Oman was ranked first among all member states in health system performance on health level, which was defined as the ratio between achieved levels of health and the levels of health that could be achieved by the most efficient health system. This performance reports how efficiently health systems translate expenditure on health as measured by disability-adjusted life expectancy (44). Furthermore, Oman ranked number eight for the overall performance among all member states and this refers to the relation of overall health system achievement to the health system expenditure (44). The efforts should be continuous to keep this good performance for the long term (40).

Another popular reform is that the MoH in Oman emphasizes decentralization as a managerial strategy and accordingly the organizational structure of the MoH headquarter, regional headquarters, and autonomous hospitals have been modified so that all these institutions can run efficiently. The decentralization process is in progress through the establishment of an integrated health system in each of the willayat. Regional General Directors enjoy considerable financial and decision-making authority for health services management (42).

2.3.3 Organization of health care in Oman

The organization of health care delivery is based on a primary health care approach with clearly delineated referral pathways between three levels of care: primary, secondary and tertiary (40, 42). The first level of care includes primary health centres (PHCCs);

extended health centres (with basic outpatients specialties such as general medicine, obstetrics and gynaecology); and local/willayat hospitals. These local hospitals are induced in PHC facilities, but some of these hospitals also provide curative secondary health care services including inpatient, outpatient, and emergency management (40).

Secondary health care is provided through regional (mostly autonomous) and sub-regional (willayat) hospitals. Tertiary care is provided through national referral hospitals each specializing in certain fields (40). The Ministry of Health also extends the services of mobile medical teams to about 2% of the population living in remote mountainous areas and offers opportunities for treatment abroad at government expense for certain services not available in the country (40).

In-spite of the development in health services, it has been reported that the health care in Oman is heavily dependent on expatriate workers. For example, during the year 2005, only around 27% of physicians and 59% of nurses were Omani citizens. A high influx of young and less experienced Omanis taking over posts from qualified expatriates may adversely affect the quality of health services (42). This challenge influenced the government to realize the importance of providing medical education and training for Omani health care professionals in collaboration with the Medical College at Sultan Qaboos University and various MoH training institutes. Recently, the population of Omani physicians and nurses have grown by about 80% and 64% respectively (40).

2.3.4 Primary health care

The PHCCs are the entry point and basic health units providing primary health care services for most patients, including patients with diabetes. There are different numbers of PHCCs distributed in the governorates and districts of Oman according to population density in each catchment area (40). The PHCCs are running by general practitioners, nurses from different nationalities, and currently there are dieticians and health educators in almost all the PHCCs.

The number of doctors and nurses in the PHCCs varies between the catchment areas; for instance, in Muscat region, there are 10 doctors and around 15 nurses in each health centre, while the number of providers is much less in the remote areas and areas with low population density (40). The staffs are rotating between the different units in the PHCCs and work in two shifts in the morning and afternoon including certain hours

during the weekends (40). Furthermore, the PHCCs are equipped with radiology unit with normal X-ray facility; dental clinic; pharmacy; and laboratory for basic blood investigations. The health are providers in these units are limited to 2-3 persons and most of these facilities like X-ray and dental clinics are generally not available in the PHCCs in the remote areas (40).

The PHCCs provide services for general medical conditions; anti-natal care; immunization services; and there are diabetes and hypertension clinics for the registered patients in each catchment area with these conditions (40). These speciality clinics are running in specific days of the week by only trained and senior doctors in addition to trained nurses in diabetes care (45). There is no diabetes specialist nurses in Oman, the nurses who provide diabetes care are known as diabetes practice nurses or diabetes educators (45).

The difficult and complicated cases of diabetes or other medical conditions are referred to higher levels of care such as secondary or tertiary care facilities according the MoH guidelines for referral (40, 45). The primary health care also offers ambulatory curative and first-aid emergency services to the population in their respective catchment areas. Some PHCCs in the remote and mountainous areas are also equipped with observation beds, and a few with normal delivery services as well (40).

The wide-ranging health policies and strategies based on the primary health care approach have resulted in rapid and significant positive changes in health and mortality pattern over the past four decades. Mortality and morbidity data show clear signs of the onset of a health transition in Oman similar to what has already been observed in the other high-income countries (42).

The need for new horizons and expansion of primary health care was emphasized by The Country Cooperation Strategy (CCS) team of Oman and WHO (42), in addition to needs for development of human resources for health with special focus on leadership and management training; community-based care; quality care; and focusing of non-communicable diseases control (42). Furthermore, Oman, with the support of WHO, is exploring further ways to reinforce its workforce in order to respond to short-term as well as longer term needs. Some examples include considering the establishment of diabetes specialist nurses, community nurses, and short-term diploma training for various health

categories, including family medicine, diploma training for medical generalists and pre-employment training for dieticians (42).

Some of the health services indicators in Oman are shown in table 2.

Table 2- Some health services indicators in Oman

Indicator	Number
Number of hospitals	62
Hospital beds (per 10,000 of total population)	17.8
Number of health centres, clinics and dispensaries (Governmental)	221
Number of private clinics	814
Total number of doctors	5,862
Doctors per 10,000 of total population	18.1
General Practitioners per 10,000 of total population	10.7
Specialist doctors per 10,000 of total population	7.4
Total number of nurses	12,865
Nurses per 10,000 of total population	39.7
Nurses: Doctors Ratio	2.2

Source: Ministry of Health Annual report, 2010(40).

2.4 Diabetes in Oman

2.4.1 Non-communicable diseases and diabetes situation

The changes brought about by demographic and epidemiologic transition since the 1970s, have had a profound impact on the health pattern and changing lifestyle of the Omani population towards less physical activity and less healthy dietary habits with consumption of high amount of fast food, high in refined sugar and saturated fat (40, 42). These changes have contributed to a marked increase in the prevalence of type 2 diabetes to 13.2% among Omani population (40).

Now the most important health challenges in Oman will be the control of non-communicable diseases and other conditions related to unsafe behaviour and unhealthy lifestyles (42). Morbidity and mortality patterns in Oman are increasing due to the rise in incidence of non-communicable diseases (42). There is also increase in prevalence of hypertension up to 36 % (40). In addition, 40% of Omanis are estimated to have high

cholesterol levels and nearly half the adult population are overweight or obese. The level of complications from diabetes is also a matter of concern: 14% of patients with diabetes have diabetes retinopathy; 20% show evidence of nephropathies; and 50% of all amputations in Oman are related to diabetes (40, 42).

Furthermore, alarming results were found in a cross-sectional survey conducted during 2001 showed that the age-adjusted prevalence of metabolic syndrome among Omani population was 21.0% (23.0% among women and 19.5% among men) (46). Metabolic syndrome is a combination of medical disorders that when occurring together, increase the risk of developing diabetes and cardiovascular diseases. Such disorders are: central obesity; dyslipidaemia; reduced high density lipoprotein (HDL) which is the good cholesterol; raised blood pressure; and fasting plasma glucose $\geq$ 6.1 mmol/L (46).

Another study in Oman concluded that diabetes affects a much greater proportion of the urban (18%) than rural (11%) population and that crude estimates indicate that illiterate and less educated individuals are more likely to have diabetes (47). The findings of the previous conditions make it likely that diabetes will continue to be a major health problem in Oman (48).

The health system in Oman has currently identified diabetes control as a priority health programme amongst all other programmes (45). The MoH has supported improvement in diabetes care, through financial support and by developing detailed guidelines for primary care facilities, where diabetes care is mainly delivered (45). These guidelines describe the responsibilities of each health care provider in the diabetes team (the doctor, diabetes practice nurse, health educator and dietician). There are other details regarding types of medicines to use, blood investigations and referral of complicated cases to secondary or tertiary care level for expert opinions (45). However, the guidelines included only a limited number of aspects with regards to provider-patient relationship or communication manners and self-management behaviour (45).

2.4.2 Diabetes and traditional food habits in Oman

The influence of culture on the Omanis' behaviour and beliefs with regard to health issues and nutrition cannot be ignored. Social expressions and culture including religion are dimensions that affect patterns and practices of health care (49, 50). In this context, the social culture of Oman can be difficult for patients with diabetes, as traditionally

sharing of meals with family and neighbours is a highly valued traditional social interaction (37). More substantial meals often have rice as a main ingredient, together with cooked meats. In addition, visitors are traditionally offered dates and local sweet *(halwa)* with coffee upon arrival. This habit is a main delight that remains a symbol of Omani hospitality throughout the country (37).

Dates are taken frequently during the day, as in the other Gulf States as there is a strong cultural and religious belief originates from the holy Qur'an about its nutritional value and it is considered as a blessing fruit (47,49). In smaller amounts dates are useful and nutritious, but the high sugar contents make them unsuitable in larger amounts for patients with diabetes (51). Moreover, the Omani halwa is a sticky sweet gelatinous substance made from sugar, eggs, ghee, honey and spices. The sweetness of this dish *(halwa)* often counteracts the bitterness of the coffee (37). However, patients with diabetes should be careful with eating such very sweet and fatty dish.

There seems to be some misunderstandings and misbehaviour with regard to amount of food intake and to healthy nutrition in Oman (52).

3 RATIONALE FOR THE STUDY

The fact that type 2 diabetes is a major and growing health problem among Omani population supports the rationale for this study. Furthermore, almost nothing is known about the quality of care or interactions between the primary health care providers and type 2 diabetes patients in Oman, despite the major role of primary care facilities in managing and controlling diabetes.

The medical interview is a core clinical skill for all health care providers, especially for primary care disciplines. A communicative provider-patient relationship is especially important in the management of chronic diseases, such as diabetes (19). In addition, patients' perspectives and expectations are important tools for the physician-patient interaction regarding diabetes care (53).

Furthermore, health care professionals are rarely asked how they handle patients' poor therapy adherence or how they handle problems during their medical encounters with diabetes patients. Hence, exploring the thoughts, expectations and feelings of health care professionals are also important tools in diabetes management (54).

Moreover, patients with diabetes should be actively supported to acquire knowledge about their disease, especially on self-management behaviour. Health care providers and the health system should facilitate their empowerment; encourage their participation in the consultations; and support them to make personal decisions in their everyday life with diabetes (29). Both doctors and patients need communication skills to cope with their expectations and need evidence-based goals in a tailored approach to diabetes care. This study was performed because we need to get basic information about the quality of provided services and to achieve more efficacious and productive medical encounters in diabetes clinics. Moreover, the study aimed at assessing the ability of patients with type 2 diabetes to perform self-management and monitor their blood glucose, and to assess their knowledge about diabetes complications.

4 AIMS OF THE STUDY

4.1 General aim

To explore the quality of interaction between primary health care providers and patients with type 2 diabetes in Muscat, Oman, and to assess the ability of patients with diabetes to perform self-management and monitoring of blood glucose.

4.2 Specific objectives

1. To observe health care providers' performance during their interactions with patients with type 2 diabetes, focusing on the consultation environment, some aspects of provided care and health education (I).
2. To explore the perceptions of type 2 diabetes patients regarding the medical encounters and quality of interactions with their primary health care providers (II).
3. To explore the experiences of primary health care providers of their encounters with patients with type 2 diabetes, and their preferences and suggestions for future improvement of diabetes care (III).
4. To assess diabetes self-management and education, treatment practices, awareness of potential long-term complications and attitudes about diabetes management in a population of urban adult Omanis living with type 2 diabetes (IV).

5 MATERIAL AND METHODS

5.1 Study design

This is a cross-sectional study using quantitative and qualitative research methods.

5.2 Setting and sample selection

In Muscat, the capital of Oman, there is currently a total of 27 PHCCs since the end of 2011. At the time of studies I-III (during 2004-early 2006), there were only 18 PHCCs, five of them in remote areas. Six PHCCs were chosen to represent different geographical areas within the Muscat Region for studies I-III. Five of the health centres belonged to the institutions of MoH, while one health centre was part of the Sultan Qaboos University, Department of Family Medicine and Public Health, providing outpatient care to the university staff and their families who live inside and outside the Muscat Region. The five PHCCs under MoH ran a diabetes clinic two days per week with 2-4 doctors working alternately, and 1-3 diabetes practice nurses, who met the patients prior to the doctor's consultations. In three PHCCs, the nurses shared the office with the doctor.

The appointment lists included 17-25 patients per day, and sometimes 30 patients in some health centres under MoH, during the formal working hours, which start from 7:30 in the morning to 2:30 in the afternoon. The health centre at the university ran a diabetes clinic once a week with six doctors alternately, and one diabetes practice nurse, and with 3-6 patients per day on the appointment list, but the diabetes clinic in the university started at a later time than the PHCCs of MoH that could be around 11 o'clock or little after.

In four MoH health centres there was one health educator, and three health centres had one dietician, who received the patients on referral base by the doctors. However, these two categories of providers were not included in the observational study as they were not present in all health centres at the time of data collection. However, in study IV, which was conducted in 2010, the situation was different as the number of health centres increased to 26 PHCCs within Muscat governorate in addition to availability of a dietician and a health educator in almost all health centres.

In sub-study I, all the doctors and practice nurses concerned with provision of care for the patients with diabetes in the six PHCCs agreed to participate, including 23

general practitioners (14 men, 9 women), and 13 women diabetes practice nurses. The doctors were of different nationalities (four Omani citizens, ten from other Arab countries, and nine from Asian and European countries), aged from 29 to 55 years, with general health work experience not less than three years.

Five doctors from the University PHCC had international diplomas regarding diabetes management after one year training, 15 doctors from the other PHCCs had participated in short-term training in diabetes care (one week), while three doctors had no special training in diabetes management. Ten of the diabetes practice nurses were Omani and three were of other Asian origin, aged from 25 to 40 years, with minimum three years of nursing experience, and with special local training in diabetes care. A total of 90 patients participated in the observation study, using the following criteria: Omani citizens, from both sexes and with type 2 diabetes.

In sub-study II, twenty-seven patients (14 women and 13 men) out of 57 recruited patients, participated in the focus group discussions (FGDs) with inclusion criteria: Omani patients; with type 2 diabetes; from both sexes and who attended the six PHCCs selected for sub-study I.

In sub-study III, a total of 26 health care professionals (19 doctors and seven nurses), working in diabetes care at the same six PHCCs, as in study I, were interviewed in 2006. We purposely aimed at interviewing the same health care professionals (23 doctors and 13 nurses), who had participated in the preceding observational study (I) but ten providers (four doctors and six nurses), could not be enrolled as they had either been transferred to other areas or were on annual leaves.

Sub-study IV was a questionnaire-based survey conducted in 2010 in 20 PHCCs within Muscat governorate. As previous research had revealed a limited understanding of diabetes in the general Omani population (55), the sample was predicted to have a mean diabetes–self management and education (DSME) score of 5.0/10 (SD=2.0). It was calculated that 246 persons were needed in the survey to achieve a representative sample of people living with diabetes in Muscat, at 5% precision and 95% confidence. A non-response rate of 25% was expected, necessitating a minimum sample of 328 participants. Patients were recruited with inclusion criteria of adult (18+ years); Omani citizen and registered with type 2 diabetes in the MoH electronic patient database. The nurses were

asked to approach every patient who happened to be scheduled for an appointment in their diabetes clinic that day, who met the inclusion criteria. Patients meeting the study criteria, as according to their medical records, were approached as they arrived for their regular scheduled appointments. Of the 370 patients approached, 309 patients (84%) agreed to complete the questionnaire. Those surveyed represent approximately 2.5% of the 12,000 people living with diabetes in the Muscat region (40) known to the MoH at the time of sampling.

5.3 Data collection

5.3.1 Direct observations

The observation method (participant or non-participant) involves a systematic, detailed observation of behaviours and talk, watching and recording what people do and say. Observations are particularly well suited for the study of the working of organizations and how the people within them perform their functions. In addition, observations may uncover behaviours and routines of which the participants themselves may be unaware (56). Direct observations of a setting have several advantages. First: the observer is better able to understand and capture the context within which people interact. Second: firsthand experience with the people in the setting. A third strength of observations is that the inquirer has the opportunity to see things that may routinely escape awareness among the people in the setting (57).

The principal investigator performed all the observations in the six facilities. The observer sat inside the consultation rooms and placed the chair in a corner that allowed less intrusion or disturbance and tried to be out of field of vision to both provider and patient as much as possible (24). Each patient was followed during consultations with the nurse and doctor. The health centres were visited on more than one occasion to enable observations of all concerned staff. In each PHCC, 15 consultations were observed, divided among the doctors who provided the diabetes care. The observations were structured by the use of checklists. The checklists were developed by the research team, commented on by some heads of PHCCs, who were family physicians, and thereafter modified. The checklists included nine aspects of consultation environment and atmosphere for doctors and nurses; eleven aspects of care provided by the doctors, including health education; and 19 aspects of care by the nurses including health

education (Appendices 1 and 2). Use of interpreter by the non-Arabic speaking doctors and consultation time were also recorded.

The aspects of care and a few aspects regarding consultation environment were obtained from the clinical guidelines for diabetes management at primary health care level, provided by the MoH in Oman. The university PHCC had almost similar guidelines for diabetes management. Most of the aspects of consultation environment were obtained from other related studies, and adjusted to the Omani context (9, 19, 31, 58-60). The consultations were recorded using audiotapes for corroboration of some of the verbal communication aspects of the observations. The audio-tapes were also used by the Arabic-speaking members of the research team and two independent examiners for testing the reliability of the observations.

5.3.2 Focus group discussions

In focus groups, the discussions aim at exploring a specific set of issues among a homogenous group of people. FGDs are distinguished from group interviews by explicit use of group interaction to generate data. This method is open and flexible. Hence, it is ideal for exploring people's experiences, opinions, wishes and concerns about a specific topic. Combining FGDs with quantitative methods can be fruitful (57, 61).

In sub-study II, purposive selection of the FGD participants was performed. The principal investigator, with the help of doctors and nurses in the health centres, identified 57 Omani patients with type 2 diabetes and from both sexes, who attended the six PHCCs. These patients were assumed, by their treating doctors and nurses, to be able to contribute to productive discussions and provide the most meaningful information in terms of the project goals. They were considered to be what Patton calls 'information-rich' cases (57).

After being contacted, 42 patients agreed to participate, but finally only 27 patients (14 women and 13 men) were able to participate in the study. Main reasons for declining as expressed by the patients were time constraints and social obligations. Some did not show up on the fixed dates for FGDs due to sudden illness or death of some members in the family. Decline could also be due to hesitation or other unknown reasons because the experience of conducting FGDs was new in Oman. The 30 patients who

declined were similar to the participants in terms of demographic characteristics such as gender, age and education level.

Four FGDs (two women and two men groups) with 6-8 participants in each group were organized. The participants agreed to conduct the FGDs in a meeting room in a secondary health care centre in Muscat, which all participants perceived as familiar and convenient and where they also felt free to talk. Thematic guides for the FGDs were developed from the results of our observations of the health care providers in sub-study I. Key areas explored included: patients' expectations, experiences, and views on the consultation environment and the provided care; the experience with the diabetes nurses, dieticians and health educators; and recommendations for future improvement in the interaction and care (Appendix 3).

The FGD sessions were led by an experienced moderator from the research team, who is a medical doctor with long experience in consulting patients with diabetes and has experience in qualitative research methods; including using FGDs. The moderator introduced himself to the participants and explained his experience in caring for patients with diabetes, which created a relaxing atmosphere among the participants in both the men and women groups. Furthermore, the moderator ensured that the discussion followed the general recommendations for FGDs (57, 61). The principal investigator took notes of the discussions and gathered information on the non-verbal communication and on the interaction between participants.

The duration of the discussions was limited to two hours including around twenty minutes for greetings, warming up and introductory chat. Refreshments were served. Each FGD was audio-tape recorded with the participants' consent, translated from Arabic into English language and transcribed verbatim. At the end of every focus group, there was a debriefing discussion between the moderator and the principal investigator.

5.3.3 Semi-structured interviews

Semi-structured interviews are a qualitative research method for data collection. It involves direct interaction between the researcher and a respondent (57). It differs from traditional structured interviewing in several important ways. First, although the researcher may have some initial guiding questions or core concepts to ask about, there is no formal structured instrument or protocol. Second, the interviewer is free to move the

conversation in any direction of interest that may come up. Consequently, semi-structured interviewing is particularly useful for exploring a topic broadly and can be suitable for any sensitive issues that cannot be discussed in FGDs (57). However, the set of questions should be asked for all respondents to guarantee credibility.

In sub-study III, an interview guide (Appendix 4)**,** was developed by the study team, based on the results from sub-study I and II. The guide was discussed and agreed by the research team, peer-reviewed by six heads of PHCCs**,** and thereafter modified. The following key areas were explored: description of the encounters and discussions with type 2 diabetes patients; experienced difficulties in interactions and communications; and suggestions for future improvement of the interaction and care. The semi-structured form used for the interviews was intended to give a frame to work within and opportunity to probe and extend the areas investigated.

The interviews were conducted by a physician (the principal investigator), who had worked in some of the health centres included in the study and was known to some of the interviewed doctors and nurses. The interviews took place in the health care providers' offices in the health centres with an average duration of one hour for each interview. Non-Arabic speaking doctors and nurses were interviewed in English (n= 10) and other participants could choose between their mother tongue Arabic (n=5 nurses) or English (n=11 doctors). All interviews were audio-tape recorded with the participants' consent and transcribed verbatim.

5.3.4 Diabetes self-management and education of people living with type 2 diabetes

In sub-study IV, a questionnaire survey for patients living with diabetes was administered by nurses, in Muscat PHCCs. The nurses were trained in survey techniques. The questionnaire was developed by the research team after reviewing studies conducted in other countries (13, 62-68), peer reviewed by six senior Omani family physicians and thereafter modified. Subsequently, the modified questionnaire was tested in pilot interviews with ten patients with type 2 diabetes attending a secondary outpatient diabetes clinic in Muscat. After that constructive changes were made in the questionnaire. Information was collected on demographic characteristics; duration of diabetes; healthcare utilization; self-monitoring of blood glucose (SMBG); knowledge about

diabetes complications; attitudes towards diabetes management; and treatment practices (Appendices 5 & 6).

5.4 Data analysis

5.4.1 Study I- The observations

The data were first entered into Microsoft Office Excel. Each consultation with a doctor or diabetes practice nurse received a score for each aspect of the two areas of consultation environment and care, including health education. The score assessed the level of fulfilment or absence of the observed aspect. Each observed aspect was granted 1 point if completely fulfilled; 1.5 points if partly fulfilled and 2 points if not fulfilled. The total score per consultation was divided by the number of aspects in each consultation and mean values of scores were calculated for all consultations for each individual doctor and diabetes nurse.

Optimum interaction in each consultation by doctors and nurses was considered if the missed aspects were less than 25%, intermediate level of interaction for those who fulfilled 50-75% of the aspects and sub-optimal interaction if the health-care provider fulfilled less than 50% of the aspects. At the PHCC level, the scores for all providers were summed up and divided by the total number of doctors and nurses respectively in each PHCC. The range for optimum, intermediate and sub-optimal performance was determined using the same cut-off levels as for individual consultations.

The reliability of the observer's scorings was checked by comparison with the two independent examiners, who made their ratings after listening to 33% (n=30) of the audiotapes of the doctors' consultations (five at each PHCC) and 20% (n=17) of the nurses' interactions. Some aspects that could not be observed through listening to the audiotapes were excluded. An acceptably high correlation between the external examiners was found, expressed by a Spearman's rank correlation coefficient of 0.74–0.81 between the Observer and Examiner 1 and 2, respectively, for the doctors' consultations. There was a similar level of correlation for ratings of the nurses' interactions (0.78–0.87) between the Observer and Examiner 1 and 2, respectively. The correlation coefficients between Examiner I and Examiner 2 were 0.78 and 0.81, respectively. Furthermore, in about half of the cases (16 and 9, respectively) the total

scores of the observations of doctors and nurses by the observer were lower than that of the other two examiners, while it was equal (n = 1 for both) or higher (n = 13 and 7) for 14 and 8 of the observations, respectively.

Association between performance and doctors' nationality, age, general work experience and special training in diabetes was analyzed with SPSS version 14, by using Fisher's Exact Test, as the sample size was small. Association between performance and gender of doctors and patients was analyzed with Minitab program version 13, by using the Mann-Whitney U test on the median scoring of the doctors who received patients of the same sex versus those who received patients of different sex. Consultation time and patients' educational levels in relation to doctor's performance were analyzed with the Kruskal-Wallis test, as there were more than two independent samples.

5.4.2 Study II- The Focus Group Discussions

Qualitative content analysis was applied within the structure of the thematic guide and for the data that emerged from the transcripts (69). The transcripts were read through several times by the authors (four medical doctors, where of two with experience of qualitative analysis, and one anthropologist) to obtain a good sense of the entire discussion.

The text was then divided into meaning units and the meaning units were condensed. The condensed meaning units were then abstracted and labelled with codes independently by two of the researchers. The various codes were compared on the basis of differences and similarities and sorted into categories. The categories were further discussed by the authors for identification and formulation of themes and sub-themes. Quotations have been added to provide meaning to the text.

5.4.3 Study III- The interviews

Qualitative content analysis was applied (57), and categories were developed inductively from the transcripts. The transcripts were read through several times to obtain a good sense of the whole text. The text was then divided into meaning units, which were labelled with codes and abstracted. The various codes were compared on the basis of differences and similarities and sorted into categories and subcategories. The first author conducted the analysis and the content in the categories were primarily checked by the last author and discussed with all authors, each of them with qualifications in public

health sciences and qualitative research. Disagreements were resolved through discussions between the authors until consensus was reached. Findings are presented as categories and subcategories with illuminative quotations to enhance credibility (57).

5.4.4 Study IV- Diabetes self-management and education

A 'DSME score' for each participant was calculated from five core questions on recognition of hyperglycaemia, response to hyperglycaemia, recognition of hypoglycaemia, response to hypoglycaemia and lastly knowledge of strategies that stabilize blood glucose (Appendix 6). Each core question was scored 2 points for a correct answer, 1 point if partially correct, zero for an incorrect answer. One point was subtracted from the total score if a response was actively harmful, for example, insulin in response to hypoglycaemia. Two authors acted as evaluators and scored each survey independently. Consensus was reached between evaluators for all responses. Sums of scores for the five core questions formed the overall DSME score, with a maximum score of 10 (2 points for 5 questions). Scores of 8-10 were categorized *good*, 4-7 *poor*, and <4 *very poor*.

SPSS Version 19 (IBM) was used for the analysis. Statistical significance threshold used was $p<0.05$. Pearson's chi-square test was used to compare binomial categorical variables, ANOVA for categorical variables with three or more categories and continuous variables, bivariate correlations for comparisons between two continuous variables, and independent t-tests were utilized for comparing binomial variables with continuous variables

5.5 Ethical approval

Ethical clearance and approval for the studies was obtained from the Medical Research and Ethics Committee of Oman and the studies were conducted in accordance with the Helsinki Declaration (70). Information sheets were sent to the heads of the PHCCs and to the health-care providers before the study started and their written consents were obtained. Verbal consents were obtained from the patients with type 2 diabetes after explanation of the study objectives and guaranteeing their anonymity.

6 MAIN FINDINGS

6.1 Study I: The observations of provider-patient interactions

A total of 175 consultations were observed. All the 90 patients with diabetes were consulted by the doctors, and 85 of them were seen by the diabetes practice nurses. Five patients in one health centre were not consulted by the diabetes practice nurse as she was not available on the day of observation. There were variations in the ways in which the health care providers interacted with the patients as shown in the tables below. The age range of patients was 35-75 years (mean =53 years). Sixty percent of the patients were women, 51% were illiterate, 24% had primary education, and 24% had intermediate to university level education.

6.1.1 Consultation environment during doctors' and nurses' encounters

Some important aspects of good communication and interaction were not fulfilled in more than 50% of doctors' consultations such as: interrupted consultations privacy by other uninvited patients and staff; not encouraging patients to ask questions or express concerns; and less eye contact with patents while talking (Table 3).

Table 3. Fulfilment of aspects of environment and atmosphere during doctors' and nurses' consultations

Consultation environment and atmosphere	Doctors' consultations %	Nurses' consultations %
Friendly welcoming	74	48
Introductory chat	81	46
Ensured privacy during consultation	49	13
Encouraged patients to ask questions	47	11
Attention all times	52	23
Gestures to continue	80	26
Eye to eye contact	49	22
Emphasis on understanding and follow up	52	16
Friendly closing and fare well	70	19

The nurses had limited interactions with the patients and created a friendly consultation environment in less than 50% of their consultations (range: 26-48%) and similarly for all

the observed aspects of consultation environment and atmosphere (range: 11-23%) as shown in table 3.

6.1.2 Performance of doctors regarding care and information

The doctors fulfilled the aspects of care and provided health education in more than 75% of the consultations (range: 78-84%), yet they inquired about adverse events of medications and smoking habits or alcohol consumption in only 9% of the consultations. Furthermore, doctors referred only a few patients to the health educators or dieticians (Table 4).

Table 4. Fulfilment of aspects of care and information during 90 consultations with 23 primary care doctors

Aspects of care and health education	Consultations %
Asked about diet compliance	84
Inquired about physical activities	84
Emphasized on blood sugar control	83
Advised on healthy life (health education)	82
Asked about medicine compliance (81 patients)*	80
Asked about symptoms	79
Described how to use the medications (83 patients)*	78
Physical examination	71
Referred the patient to health educator or dietician	18
Asked about smoking and alcohol habits	9
Asked about adverse effects of medication (81 patients)*	9

**Nine patients were on diet control only; two of them were prescribed oral hypoglycaemic agents on the day of observation; seven patients were on insulin; 74 patients were on oral medication mainly sulphonylureas (76%).*

6.1.3 Performance of the diabetes practice nurses regarding care and information

Almost all the nurses measured weight, height, blood pressure and blood sugar of the patients in a consistent manner, while the body mass index (BMI) was calculated in much

fewer consultations. Health education about diabetes and related aspects was provided in less than 30% (range: 1-28%) of the consultations (Table 5).

Table 5. Level of fulfilment of some aspects of information provided by the 13 diabetes practice nurses

Aspects of health education	Consultations (%)
Education on foot care and self-hygiene	28
Provided printed educational materials	23
Importance of self-management	20
Importance of diet control	19
Education on diabetes (symptoms, complications, management)	18
Importance of exercise	11
Importance of metabolic control	3
Education on hypoglycaemia	1
Importance of annual review for screening of complications	1

6.1.4 Overall scoring of the consultations

The overall scoring of the consultations for the 23 doctors showed that ten of them were optimal in their interactions with the patients, both creating a positive consultation environment and providing optimal care and information respectively. Nine doctors and four doctors performed at an intermediate or sub-optimal level. Forty-three (48%) of the patients had an optimal consultation environment and received optimal care and information, while the consultations were of an intermediate standard for 26 (29%) and of sub-optimal standard for 21 (23%).

The doctors' performance was significantly better if they were over 40 years old ($p=0.003$), and if they had more formal training in diabetes management ($p=0.004$). However, there was no significant association between the doctors' performance and their nationality, their general work experience, or regarding the educational level of the patients. Furthermore, there were no significant differences in performance when male or female doctors interacted with a patient of the same or other sex. Consultations of less

than ten minutes' length had significantly lower scores than longer consultations ($p<0.001$).

The overall summary score for the 13 diabetes practice nurses showed that ten nurses interacted in a sub-optimal manner. Only one patient had an optimal consultation, 20 (24%) consultations were at an intermediate level and 64 (75%) were sub-optimal. However, all the nurses spent few minutes (less than ten minutes) with the patients and the communication was short and quick in most consultations. Furthermore, the combined score for doctors and diabetes nurses showed that the interaction was optimal with type 2 diabetes patients in only one PHCC while it was sub-optimal in four PHCCs.

6.2 Study II: Patient-provider interaction from the perspectives of type 2 diabetes patients

Some of the patients' demographic characteristics are shown in table 6. The participants had experiences with health-care providers from different nationalities including Arabic and non-Arabic speaking staff and some had experience in more than one health centre due to change of their home addresses and thus the catchment area.

Table 6. Demographic characteristics of participants in FGDs

	FGDs 1 and 2	**FGDs 3 and 4**	**Non-participants**
No. of participants	13	14	30
Sex	Men	Women	11 men, 19 women
Median age (range 26–70 years)	60 years	50 years	Men: 55 years Women: 50 years (range 25–70 years)
Illiterates	3	5	11
Primary education *(grade 1–6)*	4	3	7
Intermediate education *(grade 7–9)*	1	3	3
Secondary education *(grade 10–12)*	2	2	3
University	3	1	6

Six main themes were identified: 1) patient-provider communication manner, 2) inexperienced doctors and nurses, 3) long waiting time, 4) lack of continuity of care, 5) insufficient access to health education, 6) patient barriers to good diabetes management.

Both men and women expected to be welcomed cheerfully and with an introductory chat, but this was not done by all doctors and nurses, regardless of their nationalities, cultural background or gender.

> *"I expect to meet a kind doctor who greets with a smile, asking me about my condition or if I have any problems at home. This encourages me to express my concerns" (woman).*

Other weaknesses regarding the patient-provider communication were identified by the participants such as: interrupted consultation privacy; poor attention and eye contact; lack of encouraging the patients to ask questions on the providers' side; and inability to participate in medical dialogue or express concerns on the patients' side.

> *"Doctors are not listing or pay attention, they mainly look at the computers. They are in another direction" (man).*

Many patients perceived the doctors and nurses in the diabetes clinics as not being experts and not competent enough in managing diabetes. Reasons for these perceptions were: brief consultations, infrequent physical examinations, doctors did not deal with diabetes as serious disease and did not consider their other health problems. Furthermore, it was expressed that there was poorer blood sugar control for the patients at the primary health care level.

Long waiting time up to four or five hours despite being given appointments was an issue that was raised spontaneously by almost all the patients and was expressed as stressful and unacceptable. However, some of the women considered long waiting time as a normal phenomenon in the PHCCs and felt it should not be an issue since they received free health services. In addition, they dealt with long waiting time by talking together or watching television in the waiting area. Reasons for the long waiting time in almost all the health centres: only one doctor in the diabetes clinic; delay in the nurses rooms for check-up of vital signs; disorganization from responsible staff regarding the queues; and patient factors such as not showing up on time for the given appointment.

Several patients, both men and women, addressed their need to build up on-going relations with certain doctors to avoid the variations in doctors' attitudes and in provision of information. There was no preference with regard to doctor's gender for almost all patients.

"I spoke to the doctor about some concerns, he said give me time, I will study this and tell you next time what to do, but I don't know next time when I go if I will see the same doctor or not" (man).

Most of the patients had no interactions with the health educators or dieticians, irrespective of the duration of their diabetes. Some patients expressed that they had no idea about the availability of health educators or dieticians in the PHCCs or about their role as members in the diabetes team: '*I never heard about them'.*

In a few cases, the patients had good experience of dieticians or health educators, but mainly during the first few months of diagnosis as they were not called for follow up. The patients said that the health education was mainly provided by the doctors or through written educational materials. They addressed the need for continuous health education and the ability to support their learning by appropriate audio-visual aids especially in the waiting area.

Some participants blamed themselves for their poor adherence to medical advice and healthy diet because they prefer to eat their traditional food habits, and some families are not supportive to their patients with diabetes in terms of the way of cooking and preparing food. They addressed a need for education to family members and the community as well.

Low literacy amongst diabetes patients in Oman was perceived as another barrier for good diabetes management. A few women with low literacy levels believed that they had to accept what is provided to them because they are not educated. Hence, they felt unable to be more active during consultations. In addition, some thought that negotiations might negatively affect the interaction with health care providers.

''Doctors only should decide what to do because they know better" (woman).

6.3 Study III: The interviews with the doctors and nurses

Some of demographic characteristics of the participating health care providers are shown in table 7. Three main factors were considered as barriers affecting diabetes care, related to the organization of the diabetes clinics; the patients; and the health care providers. Suggestions to improve diabetes care were also addressed. Workload and lack of teamwork approach represented the main organizational barriers. Poor patients' management adherence and influence of culture on their attitudes towards illness were

identified. From the providers' side, language barriers; providers' frustration; and aggressive attitudes towards the patients were reflected.

Table 7. Demographic characteristics of the participants

Variable	Doctors n=19	Nurses n=7
Sex		
Females	8	7
Males	11	0
Age: median (range)	40 (29-55) years	30 (25-40) years
Arabic-speaking	11	5
Non-Arabic speaking	8	2

High workload was mentioned by the participants as a major problem affecting the interactions with the patients and creating stress for both the doctors and patients. They added that only one doctor runs the diabetes clinic and has to consult a big number of patients that might go beyond 30 patients. In response to this situation most doctors had to finish too quickly with each consultation in order to avoid reactions of irritation and interruptions from other patients who had been waiting for long time to see the doctor.

> *"I get stress when the patients started shouting outside, knocking the door and asking when they will see the doctor which forced me to finish quickly with the consultation" (doctor 9).*

Another organizational barrier was the lack of teamwork approach. This finding was noticed during the observations (study I) and further reflected by the patients during the FGDs. The doctors expressed their distrust on the competency of the nurses, dieticians and health educators.

> *"Our nurses and also the health educators and dieticians are lacking good knowledge, I do not trust them all. I do everything myself" (doctor 18).*

The doctors and nurses blamed the patients for their poor adherence to healthy diet; exercise; and medicines, including refusal of insulin; and reluctance to be referred to

secondary or tertiary care. They specifically blamed the elderly and less educated, who were perceived as difficult patients as they often showed no interest and no willingness to listen to the doctor or attend health education.

The poor adherence to healthy diet is related to cultural values and beliefs among Omanis in their unhealthy traditional food in addition to the habit of consumption of large quantities of dates and local sweet *(halwa)* which were considered as a source of energy, health and wellbeing. They added that this food is inherited from the old times and their grandfathers and mothers enjoyed a good health with this food.

> *"To modify patients' diet is a real problem, one patient was angry and said he will eat what our grandfathers used to eat long time and their health was perfect" (nurse 6).*

Poor adherence to medication and refusal to use insulin were expressed to be mainly due to the patients' fear of harm or damage to body organs. The doctors particularly expressed that they experienced difficulties to convince the patients to use insulin to save their lives and that diabetes complications are related to poor glycaemic control and not to the insulin. However, a few doctors mentioned that they also had responsibility to ensure that the patients received the most appropriate treatment, including insulin when indicated.

> *"May be we are making the patients afraid of insulin, I feel there is something wrong with our way of counselling" (doctor 16).*

The doctors said that many patients preferred to use certain herbs to treat diabetes and they related their blood sugar control to these herbs only and not to the prescribed hypoglycaemic agents.

Poor cooperation of some patients, especially the elderly, concerning referral to secondary or tertiary care for annual eye check-up or for screening of complications, was also mentioned as a difficulty to good diabetes care. Reasons mentioned included distance to the referral hospitals and cost of transport. However, fear of eye check-up or need for surgical intervention was also expressed.

> *"Yes I face difficulties, the elderly patients refuse to go for eye check-up as some think that any surgical intervention with their eyes will lead to blindness" (nurse 6).*

One of the greatest barriers related to the patients was that the beliefs about diabetes among Omani patients are constructed out of cultural values and spiritual beliefs. Several patients were said to believe that any illness including diabetes comes from Allah (God) who decides their destiny and their time for death with or without having diabetes and there will be no prolongation of their lives whether they care about their health or not. These beliefs made the patients less persuaded for self-care behaviour or changing their unhealthy lifestyle.

> *"No use, he said everything comes from Allah, and no one will live longer than what is supposed to be so why to make efforts or to change their style of living" (nurse 4).*

Although the doctors acknowledged themselves for their efforts towards their patients to improve their health outcomes, some barriers to good care on the doctors' and nurses' side were identified. This included doctors' and nurses' frustration due to unsuccessful efforts to make the patients adherent to medical advices and instructions. Some doctors perceived the discussions with certain patients as useless and they preferred to behave with them as disease-oriented doctors.

Some doctors mentioned that they expressed aggression towards the non-adherent patients and sometimes they frightened them with the potential complications of diabetes. They even said that they could stop prescribing medicines, since these patients did not use them.

> *"Sometimes I scare the non-cooperative patients otherwise they will not listen. I was aggressive with one ignorant lady and told her to give you the medicine is just a waste of resources" (doctor 6).*

Contrarily, other doctors emphasized on good communication and relations with their patients even with the risk of being medically inaccurate and assured that this created trust and confidence in addition to improving patients' adherence. Those doctors denied any difficulties in interactions or in management of diabetes.

The non-Arabic speaking doctors expressed language problems with patients who did not speak English. These doctors usually asked for assistance of other health professionals from the local community or family members to translate the medical

information. They avoided deep discussions or social talk with the patients and focused only on the current medical condition.

The doctors and nurses addressed the need for organizational improvement of the diabetes clinics through less number of patients to enable better interactive communication during the medical interview. The doctors emphasized the importance of continuity of care with their patients.

> *"To see ten to fifteen patients is reasonable. It is also important to maintain continuity of care. May be there is something in my mind for this patient, maybe I want to change today or tomorrow and so" (doctor 17).*

The need for teamwork and to strengthen the role of the nurses in diabetes care was suggested and the doctors emphasized to give some responsibilities to the nurses rather than putting everything on the head of the doctors. They expressed that they wanted the nurses to be able to evaluate the conditions of the patients, and then to decide who needs to see the doctor and when.

Changing of health care professional behaviour towards patients was addressed. The doctors and nurses emphasized that there should be "a personal interest" of health care providers in diabetes care. Furthermore, they suggested avoiding giving instructions to the patients, but instead have good communication and respect their concerns.

Health education to the patients in groups, rather than individually, using attractive health education materials was also suggested and considered as important for improvement of patients' knowledge and understanding about diabetes. It was also suggested that health education should include the families and the whole community through media, and in the schools and mosques. Education to the patients on self-management and self-monitoring behaviour was also addressed.

"Promotion of self-monitoring behaviour is important and cost effective. A lot of health education is needed as our patients do not know how to care for themselves" (doctor 4).

6.4 Study IV: Diabetes self-management and education

Demographic characteristics of participating patients with type 2 diabetes are described in table 8.

Table 8. Demographic characteristics of the participants

	N	%
Sex		
Woman	184	60
Age groups		
27-39 years	41	13
40-49 years	90	29
50-59 years	93	30
60-83 years	85	28
Highest education level attained		
None	163	53
Basic	82	27
Secondary	34	11
Post-Secondary	29	9
Duration of diabetes		
Less than 3 years	74	24
3-5 Years	72	23
6-10 Years	81	26
>10 Years	80	26
Smoking status		
Yes	30	10
Previous diabetes education		
Yes	236	76
Total	**309**	**100**

6.4.1 Recognition and response to hypo- and hyperglycaemia

Over a quarter of the patients (27%) were unable to recognize hypoglycaemia or respond to it (26%). Furthermore, 50% of patients could not recognize hyperglycaemia and 60% could not respond appropriately. Alarmingly, 4% of patients gave actively dangerous responses to hypoglycaemia, such as increasing the dose of insulin or OHA, or going to sleep. Approximately the same number of patients (3%) gave actively dangerous responses to hyperglycaemia, such as drinking juice, or eating sour foods. However, most of participants mentioned at least one successful strategy for maintaining blood glucose balance and 12% failed to do so as shown in figure 3.

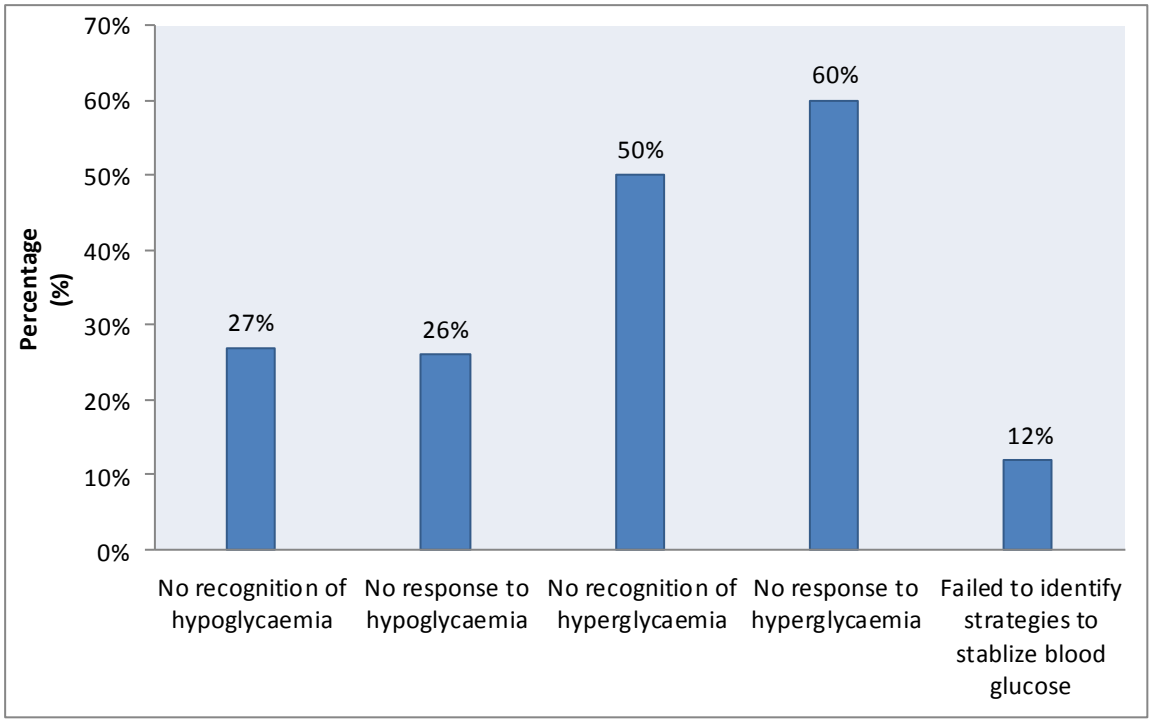

Figure 3: Gaps of knowledge in diabetes self-management and education of 309 surveyed patients.

6.4.2 Self-monitoring of blood glucose and insulin adjustments

Less than half of the surveyed patients (38%) practiced self-monitoring of blood glucose (SMBG). Explanations for not practising SMBG by the other participants included: financial expense (46%); not knowing how (36%); and having no desire to do so (26%). Usage of OHAs was more common than use of insulin as only 22% of patients were on insulin. 33% of the patients using insulin self-adjusted their dose if eating smaller or larger meal portions or if experiencing frequent hyperglycaemic or hypoglycaemic reactions. Approximately 21% of patients using insulin adjusted their dose according to physical activity levels.

6.4.3 Recognition of potential complications

A third of patients could name three potential long-term complications of diabetes. Most commonly mentioned complications were loss of vision (50%), renal problems (44%), cardiac problems (20%) and foot or wound ulcer problems (17%). Less frequently

mentioned complications were hepatic diseases (6%), stroke (5%), other vascular and atherosclerotic problems (5%), and erectile dysfunction (2%).

6.4.4 Additional support needed and role of the patient

The most common responses when participants asked what additional support they needed to better manage their diabetes were: additional health education (20%); additional support from doctors (19%); better medicines (15%); affordable glucometers (8%); more support from their families (7%); more support from nurses or dieticians (6%); and more support from pharmacists (3%). The most common responses for the patients' own role in their diabetes management were: being physically active (36%); adherence to medication (21%); following the medical advice of health professionals (7%); self-education about diabetes (5%); practicing SMBG (6%); attending appointments on time (5%), maintaining a sense of mental wellbeing (3%); and practising good foot care (2%).

6.4.5 Diabetes self-management and education scores

Median and mean DSME scores were both 5.0/10 (range 0-10, SD=2.3). Seven patients (2.3%) had the maximum score of ten, while eleven patients (3.6%) had the minimum score of zero. DSME scores of the participants are described in table 9.

Table 9. Diabetes self-management and education scores and mean score for self-monitoring of blood glucose

	N	%	Mean DSME Score (Max=10)
Sample population	309	100	5.0
Good DSME (Total Score: 8-10/10)	40	13	8.6
Poor DSME (Total Score: 4-7/10	191	62	5.5
Very poor DSME (Total Score: <4/10)	78	25	1.8
No recognition of hypoglycaemia	83	27	2.7
Incorrect response to hypoglycaemia	81	26	2.3
No recognition of hyperglycaemia	154	50	4.6
Incorrect response to hyperglycaemia	184	60	4.1
No strategy to stabilize blood glucose	37	12	2.4
Self-monitoring of blood glucose			
Yes	115	37	5.9
No	184	60	4.4

A significant association ($p<0.001$) was found between the formal education level of patients and the DSME score as displayed in figure 4. Patients who had completed some formal education were more likely to obtain good scores in comparison with less educated patients.

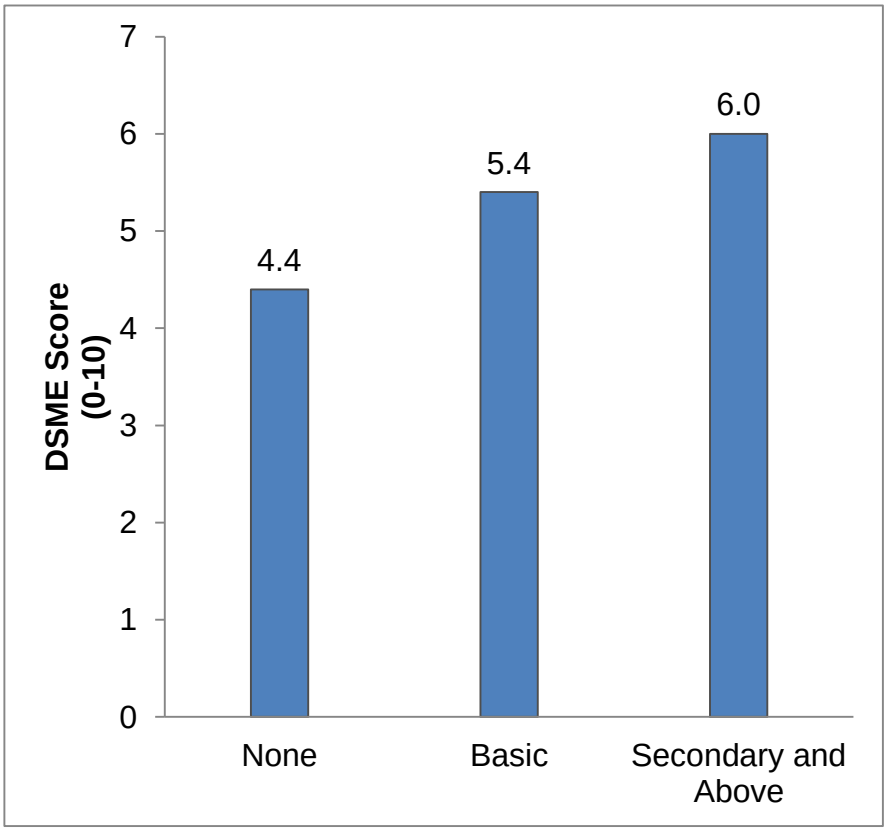

Figure 4: Diabetes self-management and education scores of sampled participants categorized by their level of formal education. A significant relationship was noted ($p<0.001$).

Patients who reported receiving some form of previous diabetes education also had higher DSME scores (5.2/10 vs. 4.2/10, $p=0.002$). Patients who had both formal education and diabetes education were significantly more likely to respond correctly to each of the five core DSME questions ($p<0.01$), except recognition of hyperglycaemia ($p=0.11$). The difference in DSME score between SMBG practisers/non-practiser was significant as well (5.9/10 vs. 4.4/10, $p<0.001$). Patients using insulin had significantly higher DSME scores (5.6/10, $p=0.01$) than the patients on OHAs (4.8/10), while ability to name three potential long-term complications was significantly associated with higher DSME scores ($p<0.001$). Furthermore, there was a significant positive correlation

between DSME scores and duration of diabetes ($p<0.01$), the longer the duration of diabetes in the subjects, the higher their DSME scores tended to be.

There were no statistically significant associations between DSME scores and sex, smoking habits, healthcare utilization, or past hospitalizations due to diabetes. Figure 5 summarizes the overall DSME score among the study population.

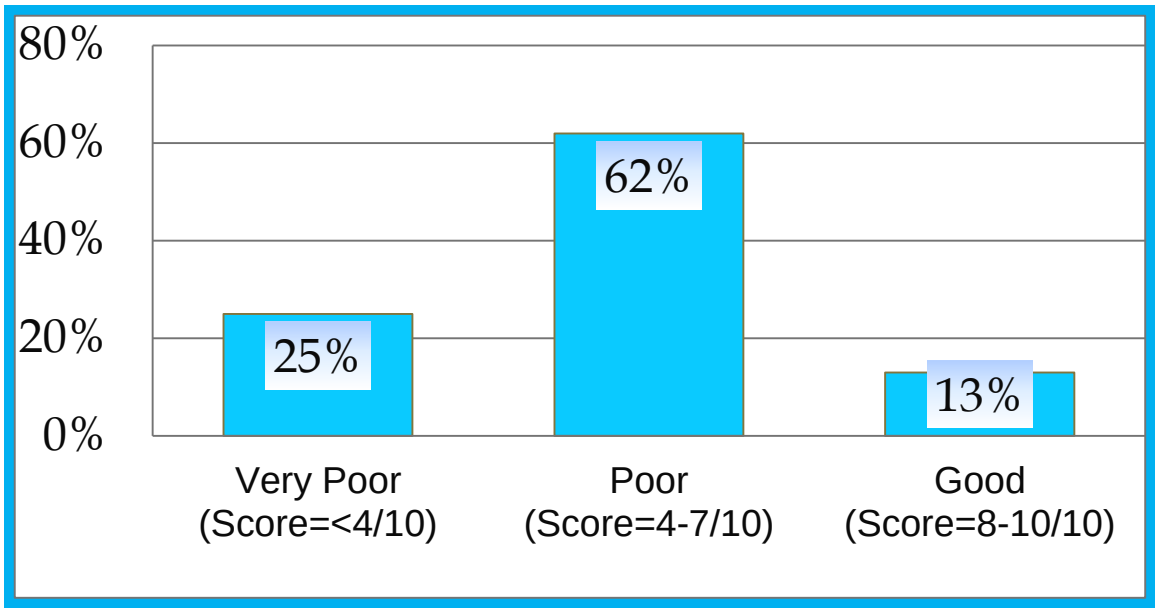

Figure 5. Overall diabetes self-education and management scores of participants (n=309)

7 DISCUSSION

The methods used in data collection for the four studies were supportive to each other and revealed almost similar findings, thus supporting our objectives and interpretations. Main findings from study I-III reflected several weaknesses concerning the quality of provider-patient communication as well as weaknesses related to organization of diabetes services, in addition to patient and professional barriers. The findings were strikingly similar in many aspects to other international findings regarding patient-provider interactions and health services in diabetes clinics at primary health care level. The findings of study IV further reflected the limited role of patients in self-management and monitoring of their blood glucose and poor knowledge about vital issues related to diabetes care.

7.1 Provider-patient interaction and communication

The observations of quality of interaction and communication between providers and patients in study I reflected that most of important aspects of good interactions were not fulfilled optimally. These weaknesses were further identified by the participants during FGDs (study II), such as unfriendly welcoming; poor attention to the patients by the doctors due to use of computers during consultations; interrupted consultations' privacy; not encouraging the patients to participate in the medical dialogue, sharing or transferring the medical information and verifying of their understanding to the provided information.

It has been concluded that good communication skills including friendly welcoming and hospitality during medical encounters are important for good interpersonal relationship between providers and patients (31). Furthermore, encounters with professionals who made diabetes patients feel attended to and who were friendly and welcoming were seen as satisfying. On the other hand, dissatisfying encounters described as being characterized by ignorance, including being treated unkindly or being made to feel unwelcome (31).

A good consultation and patient-doctor communication demands uninterrupted privacy and undivided attention to the patient (23). Attentive listening to what the patients say, giving encouragement and the use of non-verbal skills are necessary components of effective communication (71). In this respect, physicians gazing at a

computer monitor and typing on a keyboard during consultations have been shown to affect the interaction negatively because of a significant decrease in dialogue (72).

However, considering present trends, electronic medical devices of different types undoubtedly will continue to play a prominent role in health care delivery. Therefore, it is important to determine the comprehensive effects of the use of electronic devices on all the dimensions that affect the physician-patient relationship (73). It has been concluded that it is ultimately possible to improve the doctor-patient communication and care if the doctors explained to the patients why they are using computers or any other electronic devices like a personal digital assistant (PDA) (74).

Another main purpose of medical communication is promoting the exchange of information between the doctor and the patient, seeking and accepting the patients' ideas, encouraging them to ask questions and making decisions in response to their individual perspective (19, 71). This include information-giving and information-seeking, which can be seen as a contribution by both parties to the verbal interactions and a facilitating mechanism for a patient-centred approach (19, 71).

Despite that the patients during the FGDs addressed the need of a patient-centred approach during doctors' consultations, yet there were some women with low education, who expressed negative concerns and felt that doctors should decide because they know better. To implement a patient-centred care approach in the Omani health care setting there is a need to change professional behaviour towards a less authoritarian and more patient-centred style. Moreover, before patients share decision-making power, they must first be offered by their doctors the choice of participation in the medical encounters and be provided with the medical information they need (71).

7.2 Organizational efficiency of diabetes clinics and access to care

We found that four PHCCs scored sub-optimally (study I), while both doctors and nurses interacted optimally with type 2 diabetes patients in only one health centre with less work overload, which was the university health centre where only 3-6 patients were listed for each diabetes clinic day contrary to the situation in the PHCCs under the MoH. In addition, most of the doctors in this health centre had international diplomas in diabetes management. This reflects that the reasons for the sub-optimal performance could be related to the number of patients cared for (75), the competence of the individual provider

(76), and short consultation length (75). However, defining the optimal size of practice is a complex decision in which the views of doctors, patients, and health service managers may be at variance (75). It has been suggested that good doctor-patient communication inevitably takes more time. Compression of consultation time for any reason may only be possible at the cost of the quality of care (77).

Long waiting time was also a major inconvenient concern discussed by the patients. Several studies concluded that patient satisfaction with waiting time plays a crucial role in the process of quality assurance or quality management (78). Unnecessary waiting time can be a cause of stress for both patients and doctors in general practice which can have negative effect on provider-patient interaction as concluded in our studies (79). Generally patients appear reasonably satisfied if they wait no more than 35-40 minutes when arriving on time, and no more than 60-65 minutes when late for appointments (80).

The combined effect of patients' adherence to actual appointment times, and lowering the patient:doctor ratio is important for reducing waiting times and improving the organizational efficiency of the diabetes services (81). Ensuring timely access to outpatient care could be an important addition to future diabetes care quality improvement programmes (82).

Both the patients and the doctors addressed the need for continuity of care with certain doctors. The concept of continuity of care can be described as a hierarchy ranging from an availability of accurate information from one health care encounter to another (informational continuity), through a pattern of health care utilization at a particular site of care (longitudinal continuity), to an on-going personal doctor-patient relationship (interpersonal continuity) (83).

Several studies concluded that continuity of care with a primary care provider is associated with better glucose control among patients with type 2 diabetes, and that this relationship appears to be mediated by changes in patient behaviour regarding food habits (84, 85). Moreover, interpersonal continuity with a certain physician seems to be important for the patient-doctor relationship and lead to the development of trust and confidence. Thus doctors and healthcare managers should consider incorporating patients' preference for continuity into their office scheduling procedures (85).

The complexity of diabetes care requires a diffusion of responsibility for the care from physicians to nurses, and other members of the team (86). Furthermore, there is now considerable evidence that involvement of specialized nurses trained in diabetes care yields better results than traditional physician-led care as in countries like Sweden, England and the Netherlands where primary care is based largely on multi-professional teams (87).

Access to health and nutritional education are important tools in diabetes management and teamwork approach. It has been suggested that provision of continuous health education to diabetes patients, not only in the first few months of diagnosis, is a necessary component of care and should be adjusted to the patient's own individual needs. Diabetes nurses can respond well to much of these needs (88). Health education should also be adjusted to the patient's own unique understanding of their own situation (89).

Our findings emphasize the importance of recognizing and assessing individual beliefs about health, illness and medications in educational efforts to empower patients' participation in self-care (90). Furthermore, it has been proposed that the appropriate use of simple and attractive visual tools during health education is effective and positively associated with health outcomes (91).

Health education to the patients, preferably in groups rather than individual sessions, was suggested by both the doctors and the nurses. It has been reviewed that group-based training rather than individual health education is effective in improving metabolic control especially for self-management strategies among people with type 2 diabetes (92). Furthermore, it has been found that group sessions for patients with type 2 diabetes focusing on patients' personal understanding of their illness are more effective than conventional diabetes care with regard to metabolic control (93).

7.3 Barriers related to patients

The poor adherence to treatment and healthy life style, mainly among elderly and less educated patients, was perceived by the doctors and nurses as related to patients beliefs based on habits, traditions and lack of knowledge about diabetes and its management. As described above, the Omanis in general are adherent to their traditional food habits and culture (37), which considered by the doctors and nurses as a real barrier for good

diabetes management and glycaemic control. However, the whole concept of culture itself should not be misused and too broad generalizations in explaining people's beliefs and behaviours should be avoided, as there are other individually influencing factors such as age; gender; education including education; personality; intelligence; experience; occupation; and socio-economic factors (27).

Furthermore, many patients showed insufficient self-efficacy and instead reliance on God (Allah) and his destiny with regard to their diabetes. The influence of religion as a societal order is important to consider in health care irrespective of whether a person is a believer or not (90). Although most Muslims appreciate modern medicine and will seek appropriate health care, the belief in predestination may lead some patients to not comply with treatment plans or seeking care (49). The spiritual beliefs about health and illness should be highly considered by the health care providers and health education efforts should be based on patients' own beliefs about health and illness (50).

Reasons for not adhering to prescribed diabetes medicines by the patients could be related to poly-pharmacy and multiple daily dosing (94), which may create confusion regarding the drug regimen, in addition to fears of side effects and the progressive nature of the disease (15). Another perceived barrier was refusal of insulin by most of the patients, which could be related to fear of insulin or wrong beliefs that insulin can damage the body organs (95, 96). This finding was partly corroborated in study IV as a few patients were found to be on insulin therapy. It has been shown in several studies that general practitioners and nurses seem to delay insulin therapy until absolutely necessary, while specialists and other expert medical consultants are less likely to do so (96).

Furthermore, it was also mentioned that some patients seemed to prefer herbal treatment instead of modern medicines. It has been found that various traditional therapies with anti-hyperglycaemic effect are increasingly sought and preferred by patients in many countries due to lesser side effects and low cost (97,98). It has been reviewed that some medicinal plants, such as Allium sativa, Eugenia jambolana, Panax ginseng and Gymnema sylvestre, may be used as alternative treatment, as they are generally less toxic and affordable; yet, their safety and efficacy needs more evaluation by controlled clinical studies and potential herb-drug interactions should be kept in mind for those receiving conventional anti-diabetes medications (97).

Although most of the patients in study IV had knowledge about eye complications of diabetes, yet, there was a high rate of refusal by the patients to go for eye check-up as reflected in study III. It has been found, in a previous study from the United Kingdom, that fear, particularly of laser treatment, was perceived as a great barrier, deterring some patients from attending eye clinics (99).

Furthermore, there are many factors predisposing to non-attendance to referral ranging from: age of the patient; health beliefs; understanding of the disease; attitudes of health professionals; organization of the clinic; and the financial costs of attendance (100,101). It has been concluded that providing more education to patients about diabetes retinopathy, using good communication skills, and making eye clinic attendance more convenient for patients, may increase the number of patients with diabetes who accept regular eye examinations (99).

In study IV, several weaknesses regarding self-management behaviour and self-monitoring of blood glucose were identified. Most patients displayed serious DSME knowledge gaps. One of the most alarming findings was the substantial number of patients who could not mention any signs of abnormal blood glucose level especially hypoglycaemia or take corrective measures if detected. The findings further reflect insufficient health education to the patients by the primary care professionals in addition to poor patient empowerment in self-care.

Untreated or unrecognized hypoglycaemia is a serious issue as it causes confusion, clumsiness, or fainting, and in severe cases can lead to seizures, coma, and even death. It has been found that frequent episodes of hypoglycaemia eventually stops the release of epinephrine and other stress hormones when blood glucose drops too low, resulting in reduction of autonomic response and failure to recognize hypoglycaemia (102).

Patients should be given opportunities to ask their providers about the causes of abnormal blood glucose levels and ways in which it can be managed. In particular, patients displaying poor health literacy should always be provided with comprehensive verbal and written information about the complications of diabetes and anti-diabetes medicines, as potentially dangerous hypoglycaemia is a common side effect (102).

Unfortunately, there is often a mismatch between a clinician's level of communication and a patient's level of comprehension (103). This lack of understanding, if not corrected by the health care professionals, can lead to medication errors, and adverse medical outcomes. In this context, clear, simple and effective communication is essential for the effective delivery of diabetes care. Information given must consider the individual patient's level of understanding (103). The findings of study IV lead us to conclude that greater focus should be placed in the Omani clinical setting on encouraging DSME.

It has been found that a long-term, one-year educational programme for persons with type 2 diabetes in Sweden had significant reduction of the glycosylated haemoglobin (HbA1c). Furthermore, patients who were perceived to take an active role in their diabetes management had better outcomes compared to those taking a more passive role. It was also concluded that testing blood glucose levels for different purposes was better than not to test blood glucose levels at all (104).

7.4 Barriers related to health care providers

The interviewed doctors and nurses acknowledged themselves for their efforts towards their patients with diabetes to improve their health (study III). In-spite of this acknowledgement, the patients during the FGDs criticised the competency and experience of the doctors and nurses for their poor diabetes care (study II). However, some barriers to good care on the doctors' and nurses' side were also identified during the interviews. The doctors and nurses expressed frustration due to their unsuccessful efforts to make the patients adherent to medical advices and due to suboptimal health outcomes. In addition, they had to be aggressive sometimes in their interactions with the ignorant patients.

It has been found that good diabetes care with significantly better outcomes depends not only on the competency of the individual provider but also on the doctors and nurses special interest in diabetes care (76, 105). Furthermore, a comprehensive and integrated care should be provided to attain high quality management of diabetes (8). It has also been shown in many studies that patients own expectations with regard to diabetes and health do not always correspond with the objectives and expectations of the physicians' treatment proposals, and even that physicians' ambitions to achieve good results may be in conflict with the patients' motivation to lead their own lives (54).

The conflicts arise from the difficulty of integrating medical goals and patients' life experiences of illness can create a feeling of frustration for both the doctors and nurses (106). To reduce doctors' and nurses' frustration and instead of blaming the patients, it has been suggested to shift to a model of patient-provider-partnership with mutual agreement on shared decisions and closer relationship between the patient and the provider (54).

The non-Arabic speaking doctors during the interviews expressed language problems with patients who did not speak English. Studies have shown that language concordance between patients and physicians; shared understanding of advice (107); and availability of interpreters; are elements of support in the consultation and are associated with decreased communication errors; increased patient satisfaction; and adherence with medications and follow-ups (107, 108). However, it has been concluded that poor quality of diabetes care appeared to be related less to language difficulties than to professionals' attitudes and methods of working (107).

7.5 Methodological considerations

7.5.1 Observation bias

A certain degree of observation bias is possible in study I as all observations were made by a single researcher. Theoretically, two independent observers might have produced more reliable data. However, the performance of health care providers may be affected by the situation that someone is making observations, positively or negatively regardless of how non-obtrusive observations are made (57). Therefore, as these kinds of observations have not been done before in the health care services in Oman, we highly judged the importance of being as little intrusive as possible, favouring using only one observer.

However, to make it possible to test for reliability of the observations and to allow other members of the research team to get some information about the actual interaction and to perform reliability testing, all consultations were recorded on audiotapes. Furthermore, pre-tests had been done before the start of the actual observations to ensure accurate and consistent performance of the observer.

There are also some advantages of using only one observer. It means that all observations are made in a similar way and that the health care providers only need to meet one other person, who will then become less of a stranger and thereby probably influence the actual performance to a lesser extent. Multiple observations were performed with each doctor and nurse and found that after 1–2 observations, the behaviour of doctors and nurses seemed not be affected or changed by having an observer in the consultation room. This finding is supported by the study of Parchman et al (2006), who also had one observer for all medical encounters in a diabetes clinic (109). The additional reliability test by two independent examiners showed acceptably high levels of correlation and that the scorings by the observer were not systematically higher or lower than those of the independent examiners.

7.5.2 Limitations of the FGDs and the interviews

The main goal in qualitative research is to understand reality and gain information about issues or situations of central importance for the purpose of the inquiry rather than empirical generalization (57). The trustworthiness of the findings is essential in qualitative research methods. In this context, a reasonable degree of credibility was reached through the way in which the interviews and FGDs were conducted, including the questions asked. There was also a debriefing between the moderator and the principal investigator (assistant moderator) at the end of every focus group to discuss the most important themes and possible differences with other focus groups. Furthermore, representative quotations from the transcribed text were shown, which is regarded to enhance the credibility (69).

A possible limitation is that a man moderator conducted also the women FGDs, which could potentially inhibit the discussion in contrast to having a moderator of the same sex. However, the topics raised and the scope of the discussions were of similar character in the men and women groups, which may indicate that the field of exploration was not too sensitive to create uncomfortable feelings among the women in the presence of a man as moderator. In addition, the moderator worked for long periods in diabetes clinics with a large number of men and women patients. Furthermore, the presence of certain young and educated women in the groups seemed to stimulate the others (61), who were less educated and might have been shyer.

In terms of dependability (truth value of results in relation to data) it is acceptably high in this study. The same question frames were used for all groups and all interviewed providers, although some new insights were acquired by the investigators that subsequently influenced follow-up questions or narrowed the focus of observation. Furthermore, judgments about similarities and differences of content were addressed through an open dialogue within the research team. The team members independently reviewed the transcripts and regular team meetings were held during data analysis to explore patients' and providers' underlying reasoning, to discuss deviant cases and to reach agreement on recurrent themes based on the pattern and relationship between the categories (57, 61).

The usefulness or transferability of the results is dependent on how well existing views and perceptions among patients with type 2 diabetes and the views of doctors and nurses were captured, and how well the contextual background (study setting, participants, data collection and analysis) is presented (61). This applies to the qualitative studies presented in this thesis. One possible limitation could be related to the connection between the investigators and the authority or institution under study. Patients' fear of disclosure or fears of making revelations to members of their own social circle are also possible (61). Such connection and limitation are also possible with regard to the interviews with the doctors and nurses as the principal investigator is a medical doctor employed by the MoH. Another possible limitation is that changes in the setting from the time of data collection to date might affect transferability of the findings (57). However, there were no changes in the guidelines for diabetes care during this period.

A fourth aspect of trustworthiness in qualitative research is the confirmability which measures how well the findings are supported by the data collected and to the degree to which the results could be confirmed or corroborated by others (57), and this applies to this study as has been shown in the previous sections. In addition, there is an agreement and symmetry between the findings of the four studies.

Furthermore, methodological triangulation was used for data collection, which can be considered as strengthening the interpretation of the findings (57). However, methodological triangulation is not necessarily producing integrated results. Indeed, the evidence is that one ought to expect initial conflicts in findings from quantitative and

qualitative data and expected these findings to be received with varying degrees of credibility (57). Triangulation with multiple analysts is effective in assessing the consistency of the data obtained (57), and this approach was used by the research team in the four studies.

The strategy to select participants, who are expected to contribute 'rich information', may have some limitations (57). The information available prior to selection may be inadequate and there might be a risk that the participants are selected too much on grounds of verbal competence. However, the participants in the FGDs were recruited with variation regarding education and diabetes duration.

There was some heterogeneity with regard to characteristics of some group members in terms of education level and age. The heterogeneity of the participants regarding their social background is known to have a potentially negative impact on the discussion (61). However, this did not seem to reduce a productive sharing of essentially similar experiences during the FGDs (61). Furthermore, although the number of interviewees was limited, the participants had the appropriate competence and practice experience to reflect in the explored topics.

7.5.3 Limitations regarding the questionnaire-based survey

Limitations of this study include those associated with all verbally administered surveys: recall bias, verbal misunderstandings, and the influences of participant and interviewer interaction (110). The sample comprised patients solely at the primary care level and did not include secondary or tertiary facilities; patients using private sector healthcare; healthcare in neighbouring countries; or persons with diabetes who did not seek health care. The study was also conducted in the capital city. Therefore the findings may not directly be applicable to the whole of Oman. However, the structure of primary care is the same throughout Oman, so it is plausible that DSME is similar or even lower in other parts of the country due to lower proportion of formal education and other socio-economic factors. The level of formal education in our sample was also quite low, especially in older patients, which calls for caution when generalizing these findings to other settings. Moreover, due to the lack of an established and validated DSME assessment tool in Oman, a newly developed tool was utilized.

8 CONCLUSIONS AND RECOMMENDATIONS

There is a need for an efficient use of available resources in diabetes clinics in Oman; clearly defined professional roles with emphasis on teamwork approach; and appropriate continuous training of the health care providers to improve their skills in diabetes care.

Perceptions of both the patients with diabetes and of the health care providers are important for improving practice. In this respect, diabetes team members should consider support to the patients through education on self-care using good communication skills and understanding of cultural beliefs of the patients.

Moreover, there is a need to improve knowledge transfer to people living with diabetes regarding diabetes self-management and self-monitoring behaviour so that they can successfully take on more responsibility for managing their disease. This can only be done through allotting time and facilities for long-term educational programmes by well-trained doctors, nurses and health educators.

Barriers to self-monitoring of blood glucose should be overcome and it would be an advantage if glucometers were affordable especially to the poor people living with diabetes in Oman.

Successful improvement of the organizational efficiency of diabetes clinics; improving communication skills and work situation of the health care providers; understanding and support individual patients' needs and encouraging a patient-centred approach, could lead to a decrease of the workload; timely access to outpatient care; reduction of the frequency of visits to the health centres; improved metabolic control; and thereby a decrease in morbidity and mortality due to diabetes complications.

A discussion of our findings among the policy makers and health care planners in the MoH in Oman could lead to suggestions to strengthen and improve the quality of diabetes care and health outcomes.

Barriers to adherence to the guidelines need to be further explored. However, a final new version of Omani diabetes guidelines was launched on 14 October 2012. The new guidelines for diabetes management are expected to play a considerable role in improvement of care and services of diabetes and its associated risks.

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11 APPENDICES

Appendix 1. Checklist for the doctors

- Nationality of the doctor
- Asked for interpretation — Yes | No
- Friendly welcoming (*indicated if doctor; greeted with a smile, called by names or shook hands*). — Yes | No
- Introductory chat — Yes | No
- Ensured privacy of consultation — Yes | No
- Asked about symptoms — Yes | No
- Inquired about diet adherence — Yes | No
- Inquired about medicine adherence — Yes | No
- Inquired if patient had any adverse reactions to medicine — Yes | No
- Inquired about physical activities — Yes | No
- Inquired about risky habits (*such as smoking or alcohol consumption)* — Yes | No
- Performed physical examination — Yes | No
- Encouraged the patient to ask questions — Yes | No
- Paid attention to the patient — Yes | No | Sometimes
- Performed eye contact with the patient while talking — Yes | No | Sometimes
- Did some gestures to encourage patient to continue (such as head nodding, vocal intonation etc) — Yes | No
- Advised on healthy life — Yes | No
- Emphasised on patient's understanding and follow up — Yes | No
- Emphasized on blood sugar control — Yes | No
- Referred the patient to health educator or dietician — Yes | No
- Described how to use the medicine — Yes | No
- Friendly closing and farewell — Yes | No
- Consultation length (in minutes) — 0-9 min. | 10-20 min. | 20-30 min. | > 30 min.

Appendix 2. Checklist for the diabetes nurses

- Nationality of the nurse
- Asked for interpretation — Yes / No
- Friendly welcoming (*indicated if the nurse; greeted the patient with a smile, called by names or shook hands*) — Yes / No
- Introductory chat — Yes / No
- Ensured the privacy of consultation — Yes / No
- Took the basic measurements — Weight / Height * / BMI / B. Sugar / B.P
- Reviewed the previous readings — Yes / No
- Commented on the readings — Yes / No
- Inquired about diet adherence — Yes / No
- Inquired about medicine adherence — Yes / No
- Inquired about physical activities — Yes / No
- Provided basic education about diabetes *(symptoms, complications, management etc.)* — Yes / No
- Explained the importance of self-management and monitoring** — Yes / No
- Explained the importance of diet control — Yes / No
- Explained the importance of physical activities — Yes / No
- Explained the importance of good metabolic control and its relation to complications — Yes / No
- Explained the importance of annual review for screening of complications — Yes / No
- Educated about foot care and self-hygiene — Yes / No

- Educated about hypoglycaemia & how to deal with it — Yes / No
- Emphasized on the patient's follow up and understanding to the provided information
- Encouraged the patient to ask questions — Yes / No / Sometimes
- Did some gestures to encourage the patient to continue *(such as head nodding, vocal intonation etc)* — Yes / No
- Performed eye contact with the patient while talking — Yes / No / Sometimes
- Paid attention to the patient — Yes / No / Sometimes
- Provided printed educational materials — Yes / No
- Warm closing & farewell† — Yes / No

* *The height was checked on the same day of observation for some patients or checked once in the first visit of the patient. This was considered during observations and the investigator obtained this information from the diabetes booklet of the patients whom their heights were not checked on the day of observation*

***Self-management refers to changes/modifications in life style that help controlling the blood sugar like cooking process and preparing meals, amount of dates to be taken, exercise, stress management, home glucose monitoring, keeping record and monitor blood pressure*

† Was *considered if the provider had some social talks with the patients at closing of the encounters or emphasised on what was discussed during the encounters; reassured the patient; asked the patient if anything else; said goodbye and thanked the patients.*

Appendix 3. Guide topics for the FGDs

1-We want you to discuss about your opinions and views on the interaction with the health-care providers and what you expect to get when you meet them during consultations. It is an open discussion and we want you to feel at ease and free to talk. We want to hear from all of you. We will start with the doctors, please tell us what you feel when you meet the doctors from the beginning of the consultation to the end of it, and what you like and what you do not like.

(Checklist for the moderator included: welcoming, consultation privacy, attention, eye contact, encouraging questions asking, and consultation length).

2-What is your opinion about the provided care?

(Checklist for moderator included: history taking, physical examination and role of the diabetes nurses).

3-Please tell us about your experience with the dieticians and health educators in your health centres?

4-A question for the females groups; How you perceive the encounters with male doctors?

5- What are your suggestions to improve the quality of interaction with the health-care providers?

Appendix 4. Questions asked during the interviews

Thank you for being willing to take part in this interview. I would like first to assure you that no records of this interview would be kept with your name on them.

1- Could you please start by describing an adult type 2 diabetic patient you have seen recently?

Probes:

-Please tell me what happened when this patient came to you?

-Could you describe what you discussed when this patient consulted you?

-What did you tell this patient about his/her health condition?

-Did you experience any difficulties in the communication and interaction with this patient?

2- In general, do you experience difficulties in communication with the diabetic patients? If difficulties are present the following 2 questions are:

2a- Will you please explain types of difficulties?

2b- How do you deal with such difficulties?

3-Are you usually able to see solutions to problems and difficulties when dealing with diabetic patients?

4- What are your suggestions to achieve optimum interaction with patients with type 2 diabetes in the future?

Appendix 5: Diabetes self-management questionnaire

First a few questions about you:

1. Sex: a) Man b) Woman

2. Age:

3. Education Completed: a) None b) Basic education

c) Secondary education d) Post-Secondary education

4. Do you smoke tobacco or shisha? a) Yes b) No

5. How many years have you known that you have diabetes? _____

6. How many times in the past year (365 days) have you been to visit a clinic or any sort of health care facility due to your diabetes? _____

7. Have you ever been hospitalized due to your diabetes? a) If yes, how many times?

b) No

8. Have you ever received any form of diabetes education? a) Yes b) No

Knowledge about diabetes and related practices:

9. How can you know if your blood sugar is low?

10. What do you do when your blood sugar is low?

11. How can you know if your blood sugar is high?

12. What do you do when your blood sugar is high?

13. What are ways you can help keep your blood sugar from getting too high or low?

14. Can you mention three long-term complications of diabetes?

Attitudes towards diabetes management:

15. What kind of support do you need for your diabetes management?

16. In your opinion, please tell me what is your role in your diabetes management?

Self-management practices:

17. Do you take insulin(s)?

a) Yes b) No

IF YES, please answer the following questions:

i. Do you change your dose if you know you will be eating more or less than usual?

a) Yes b) No

ii. Do you change your dose if you know you will be more physically active than usual?

a) Yes b) No

iii. Do you change your dose if you find your blood sugar is too often high or low?

a) Yes b) No

iv. When do you normally take your insulin with your meal?

a) Before b) After c) Some times before, sometimes after

18. Do you take oral medications for your diabetes?

a) Yes b) No

19. Do you monitor your blood sugar at home? a) Yes b) No

a) If yes, how many times per week: −

b) If no, why not? i) It is unaffordable ii) I do not know how to do it iii) I do not want to

20. Have you gone to an eye-doctor within the last year?

a) Yes b) No

Appendix 6: Diabetes self-management and education assessment scoring

Question	Appropriate Answers	Scoring
How can you tell if your blood sugar is low?	Cold sweat, shaking, slurred speaking, confusion, lack of coordination, staggering gait, fatigue, nervousness, excess hunger, headache, blurred vision, dizziness, abdominal pain, nausea, SMBG, fainting	*Two Correct = 2* *One Correct = 1* *None Correct = 0*
What do you do when your blood sugar is low?	Consume juice, raw sugar, honey, or any other quick way to ingest sugar orally	*Any Correct = 2* *None Correct = 0*
How can you tell if your blood sugar is high?	Thirst, headaches, difficulty concentrating, blurred vision, frequent urination, fatigue, SMBG, persistent vaginal and skin infections, slow-healing wounds, cold or insensitive feet, loss of hair on the lower extremities, erectile dysfunction, chronic constipation, wasting, anorexia, teeth and oral problems, bad breath, palpitations and shortness of breath (ketosis)	*Two Correct = 2* *One Correct = 1* *None Correct = 0*
What do you do when your blood sugar is high?	Drink water, inject insulin, adjust dosage, exercise, and abstain from eating or cut back on portion size	*Two Correct = 2* *One Correct = 1* *None Correct = 0*
What are some ways you can help keep your blood sugar from getting too high or low?	Adjust medication and/or diet, follow an exercise regime, eat consistent food content and amounts, keep regular meal times, test blood sugar regularly, ask for advice from health care providers	*Two Correct = 2* *One Correct = 1* *None Correct = 0*
-1 per dangerous response, e.g. insulin for hypoglycaemia response		**Max Score = 10/10**